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***Final Progress Report
US Automotive Pollution Prevention Project***

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EXECUTIVE SUMMARY

This is the fourth and final progress report of the US Automotive Pollution Prevention Project (US Auto Project), a voluntary pollution prevention and resource conservation partnership among Chrysler Corporation, Ford Motor Company, and General Motors Corporation (Auto Companies). The US Auto Project originated from the Council of Great Lakes Governors' (CGLG) Pollution Prevention Challenge. In September 1991, five organizations -- Chrysler, Ford, General Motors, the American Automobile Manufacturers Association (AAMA), and the Michigan Department of Environmental Quality (MDEQ) -- agreed on a voluntary pollution prevention action plan to reduce the use, generation, and release of persistent toxic substances that adversely affect water quality in the Great Lakes. A similar project is ongoing in Canada.

The original Auto Project expanded in September 1995 from a regional Great Lakes focus to a national effort and was renamed the US Auto Project. In addition, the Project scope increased to include other materials of concern in addition to the Great Lakes Persistent Toxic substances (GLPTs). AAMA became the administrator for the Project with the MDEQ, CGLG, and US EPA Region V providing guidance and counsel. An Advisory Group representing diverse stakeholder interests was formed in April 1994 to provide advice and support to the US Auto Project.

With the anticipated dissolution of the AAMA (the Project administrator), the current structure of the US Auto Project will conclude. However, the Auto Companies will individually continue to report publicly on their environmental progress and to participate in federal and state voluntary pollution prevention programs.

Mission Statement and Operating Guidelines

The US Auto Project Mission Statement and Operating Guidelines provided the flexible framework within which each Auto Company worked to interpret and apply these guidelines in accordance with their respective internal principles, policies, and procedures.

Progress

This final US Automotive Pollution Prevention Project report highlights the significant progress by Chrysler, Ford, and General Motors in reducing the use, generation, and release of toxic substances, as well as other materials of concern.

- 26 percent reduction in reportable releases of Great Lakes Persistent Toxic substances (GLPTs) on a vehicle produced basis since the Auto Project began in 1991
- 63 percent reduction in GLPTs (excluding foundry zinc releases) on a vehicle produced basis since the Auto Project began in 1991
- 46 percent reduction of EPA Toxic Release Inventory (TRI) reportable releases on a vehicle produced basis since 1991 and 60 percent reduction from the 1988 baseline year established for TRI.

Important successes of the Project also include:

- Improved dialogue and relationships among government, industry, and Advisory Group members
- Creation of opportunities for summer interns to participate in pollution prevention activities within the Auto Companies
- Recognition of the Project as a model of government and industry cooperation
- Development of a forum for combined public accountability and reporting of GLPT and TRI data and reduction efforts

Case Studies

The US Auto Project case studies were developed by Chrysler, Ford, and General Motors, published by AAMA, and provided to the MDEQ on a periodic basis. Seventy eight pollution prevention case studies have been produced by Chrysler, Ford, and General Motors. These case studies demonstrate the Auto Companies' ongoing progress to integrate pollution prevention practices within their operations and to transfer technology information to suppliers and other interested parties.

Future Direction

Through the US Auto Project, Chrysler, Ford, and General Motors have reduced waste generation and disposal and reduced costs. The US Auto Project demonstrates the benefits of a pollution prevention partnership. Chrysler, Ford, and General Motors will continue their support for implementation of the US Auto Project Mission Statement and Operating Guidelines and reiterate their commitment to communicate progress to the public.

Final Progress Report
US Automotive Pollution Prevention Project
November 1998

I. PROJECT OVERVIEW

Chrysler, Ford, General Motors (AAMA Member Companies or Auto Companies), and their trade association, the American Automobile Manufacturers Association (AAMA), are pleased to issue this fourth and final progress report for the US Automotive Pollution Prevention Project (US Auto Project). A summary of the aggregate data is provided below in Table 1.

Table 1. Summary of AAMA Member Company US Auto Project Overview Data*										
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
No. of Vehicles Produced in US	10,264,257	9,656,149	8,305,684	7,201,274	8,042,561	8,843,299	9,876,015	9,449,420	9,258,561	9,497,817
GLPTs Released (lbs)	27,262,733	30,724,373	23,956,789	20,296,447	16,369,401	16,644,176	21,098,218	24,221,926	21,356,567	19,959,385
Total TRI Released (lbs)	160,382,251	124,021,407	89,676,140	83,153,674	68,360,067	69,717,276	72,035,186	69,151,834	60,610,579	59,159,206
GLPTs (lbs) per Vehicle Produced	2.66	3.18	2.88	2.82	2.04	1.88	2.14	2.56	2.31	2.10
TRI (lbs) per Vehicle Produced	15.63	12.84	10.80	11.55	8.50	7.88	7.29	7.32	6.55	6.23

*Includes direct releases to air, land, and water, but does not include off-site transfers of GLPT and TRI reportable substances which were recycled or used as alternative fuels for energy recovery.

II. ACTIVITIES

The continued achievements of the US Auto Project provide an example of how a flexible and cooperative industry partnership can achieve environmental improvements. Additionally, the US Auto Project has allowed for new relationships among stakeholders as well as the exchange of non-proprietary pollution prevention information. This information exchange has led to improved management systems within the automotive industry.

The Auto Companies are continually researching and implementing pollution prevention initiatives within their operations. Many of these initiatives are developed into case study materials (Appendix G) that are available through the MDEQ.

The AAMA has provided the administrative support for the US Auto Project. In addition, the US Auto Project Work Group has been responsible for the implementation of the Project within the Auto Companies. The Work Group has been comprised of representatives from Chrysler, Ford, General Motors, and the AAMA, and was responsible for:

- Promoting implementation of pollution prevention (P2) technologies
- Developing communication materials, e.g., case studies, progress reports, presentations
- Planning pollution prevention workshops and conferences
- Providing administrative support for the US Auto Project Advisory Group
- Coordinating efforts with the Canadian Auto Project

POLLUTION PREVENTION MISSION STATEMENT & OPERATING GUIDELINES

The American Automobile Manufacturers Association (AAMA) Member Companies -- Chrysler Corporation, Ford Motor Company and General Motors Corporation -- pledge their continued support for the objectives of the US Automotive Pollution Prevention Project. The mission statement and operating guidelines provided a flexible framework within which each company worked to interpret and apply these guidelines in accordance with their respective internal principles, policies and procedures.

Mission Statement

Chrysler, Ford, and General Motors will promote pollution prevention throughout their business operations, products and practices by concentrating on reduction in the use, generation and release of persistent toxic substances and other materials of concern. The efforts will be conducted in a manner that enhances environmental and competitive performance within each company.

Operating Guidelines

Chrysler, Ford and General Motors will:

1. Use innovative and cost effective pollution prevention approaches to reduce waste and the potential risks to human health and the environment.
2. Apply multi-media, life-cycle considerations in the early design stages of products and processes to conserve resources, prevent pollution and recycle materials, wherever practical.
3. Integrate pollution prevention into the company through proactive, voluntary efforts that meet or exceed all environmental regulatory requirements.
4. Encourage employees to utilize their knowledge and skills to identify and implement pollution prevention ideas as well as recognize outstanding employee contributions.
5. Transfer pollution prevention knowledge within the company and exchange non-proprietary technologies with suppliers and other interested parties.

6. Support non-competitive collaborative research and development of clean technologies among automotive suppliers, technology centers, academia and government.
7. Publish periodic reports with measurable results to profile continuous pollution prevention improvements.
8. Support public dialogue on pollution prevention efforts and opportunities.

POLLUTION PREVENTION CASE STUDIES

The US Auto Project case studies demonstrate the Auto Companies' ongoing progress to integrate pollution prevention practices within their operations and to transfer technology information to suppliers and others. Three case studies were developed by each of the Auto Companies every six months. The studies were published by the AAMA and submitted to the MDEQ. A table of the case studies submitted since the beginning of the US Auto Project is provided in Appendix G. In addition, copies of the 78 case studies completed through April 1998 are available on the MDEQ internet site at www.deq.state.mi.us/ead/p2sect/auto/.

POLLUTION PREVENTION STUDENT INTERNSHIPS

In support of their GLPT reduction efforts under the US Auto Project, the AAMA and the Auto Companies sponsored a student summer intern program with the National Pollution Prevention Center (NPPC) at the University of Michigan. Under this intern program, students have worked with the Auto Companies and the AAMA to help identify potential improvements that could reduce environmental impacts, wastes generated, and costs incurred from similar manufacturing processes at Chrysler, Ford, and General Motors plants.

The intern program provided students an opportunity to evaluate the processes, procedures, and practices of three different Auto Company assembly and component manufacturing plants and propose non-proprietary best management practices. In conjunction with the evaluation, the interns also developed industrial pollution prevention case studies that the NPPC used to develop educational curricula. Copies of the intern case studies are available through the NPPC or can be accessed on the MDEQ internet site at www.deq.state.mi.us/ead/p2sect/auto/.

The case studies developed during student summer internships were:

- *Auto Body Solvent Wipe Process*
- *Paint Spray Booth Cleaning Practices in the Automotive Industry*
- *Reduction Opportunities for Great Lakes Persistent Toxic Substances in the Automotive Industry*
- *Pollution Prevention/Waste Minimization Study at an Automotive Supplier Plastics Plant*
- *Environmental Evaluation of Hydraulic Fluids, Oils, and Greases Used in Manufacturing & Maintenance Operations*

SUPPLIER OUTREACH AND TECHNOLOGY TRANSFER

Supplier outreach and technology transfer have been significant components of the US Auto Project. The primary objectives of this outreach were to:

- Inform suppliers about the Auto Companies' intent to reduce the generation and release of GLPT substances and other materials of concern
- Inform suppliers about the importance of reducing their releases of GLPTs and other materials of concern
- Provide specific case study information and technology transfer for suppliers to consider in their manufacturing operations
- Plan and participate in a number of supplier outreach and technology transfer efforts including co-sponsorship of waste reduction and energy efficiency workshops

The Auto Companies also have incorporated engineering specifications pertaining to targeted substances into their routine business practices. These specifications apply to product components and manufacturing processes and materials. Examples include the reduction in mercury switches, halogenated and non-halogenated solvents, and heavy metals.

On November 6, 1997 a Waste Reduction '97 - Tools to Improve Efficiency and Productivity Workshop, co-sponsored by MDEQ was held in Southfield, Michigan for nearly 300 attendees. The automotive track provided by Chrysler, Ford, and General Motors speakers was highly attended and well received. AAMA provided major funding support for this successful workshop attended by a significant number of automotive suppliers.

On November 5, 1998 a Waste Reduction '98 - You Can Make it Happen! Workshop will be held in Livonia, Michigan. This will be the 6th Annual Great Lakes Region Workshop dealing with environmental improvements and reducing costs, risks, and liabilities. Consistent with the 1997 workshop, there will be an automotive track in which speakers from Chrysler, Ford, General Motors, and their suppliers will share their successes.

US AUTO PROJECT ADVISORY GROUP

In April of 1994 the US Auto Project Advisory Group was established to facilitate public information exchange, develop confidence in the effectiveness of the Project, and help accomplish the objectives of the US Auto Project. Members, representing organizations with expertise in pollution prevention, manufacturing and/or environmental policy, participated in the Advisory Group. See Table 2. The Advisory Group members represented a cross section of organizations including trade associations, public interest groups, foundations, higher education, technology centers, and government.

The Advisory Group met twice each year. Among the issues discussed by the Advisory Group were:

- Methods for measuring success and the pollution prevention process in each of the Auto Companies
- Content and format of US Auto Project Progress Reports
- Future directions concerning communication and supplier participation
- Status of the US Auto Project

The Advisory Group played a significant role in the success of the US Auto Project.

Table 2. AAMA Members* and US Auto Project Advisory Group Representatives and Associated URLs

Representative	Organization	URL (Uniform Resource Locator)
Don Edmunds	*American Automobile Manufacturers Association	http://www.aama.com
Debby Rowe Doug Orf	*Chrysler Corporation	http://www.chrysler.com
Phil Lawrence Sue Rokosz	*Ford Motor Company	http://www.ford.com
Sandra Brewer	*General Motors Corporation	http://www.gm.com
Aaron Lowe	Automotive Parts and Accessories Association, Inc.	http://www.apaa.org
Don Weaver	CAMP, Inc.	http://www.camp.org
Stewart Forbes Marianne Lines	Canadian Centre for Pollution Prevention	http://www.c2p2.sarnia.com
Naureen Rana	Council of Great Lakes Governors	http://www.cglg.org
Charles Griffith	Ecology Center of Ann Arbor	
Kevin Mills	Environmental Defense Fund	http://www.edf.org
Marcia Horan	Michigan Department of Environmental Quality	http://www.deq.state.mi.us/ead/p2sect/auto/
Matthew Hare	Michigan Manufacturers Association	http://www.mma-net.org
Lois DeBacker	C.S. Mott Foundation	http://pprc.pnl.gov/pprc/rfp/cs_mott.html
Paul Chalmer	National Center for Manufacturing Sciences	http://www.ncms.org
Robert Nelson	National Paint and Coatings Association	http://www.paint.org
Jonathan Bulkley	National Pollution Prevention Center for Higher Education	http://www.umich.edu/~nppcpub/
Michael Kelley	Ohio EPA	http://www.epa.ohio.gov
Phil Kaplan	US EPA Region V	http://www.epa.gov

US / CANADIAN COORDINATION

In May 1992, Canada initiated a parallel Automotive Pollution Prevention Project with the same objective of reducing persistent toxic substances and other materials of concern. Participants include: Canadian federal and Ontario provincial governments; Chrysler, Ford, and General Motors' Canadian affiliates, and their trade association.

To ensure coordination, Auto Company representatives of the US and Canada Projects met twice a year to discuss a variety of topics including: status of the respective Projects, measurements of success, communication tools, identification of substances that were the focus of reductions, and public involvement.

Six progress reports have been published for the Canadian Auto Project. Copies are available through the Canadian Vehicle Manufacturers Association (CVMA) at 25 Adelaide St. East, Suite 1602, Toronto, Ontario, Canada M5C 1Y7.

The Canadian Pollution Prevention Project will continue.

EXTERNAL POLLUTION PREVENTION EFFORTS

The lessons learned from the US Auto Project have provided valuable insights which are helping to make other voluntary initiatives more effective. Additional pollution prevention initiatives in which Auto Companies participate, include programs such as:

- EPA WasteWise
- EPA Climate Wise
- EPA Energy Star Buildings/Green Lights
- Michigan Clean Corporate Citizen
- Ohio Prevention First
- United States Council for Automotive Research (USCAR)

COMMUNICATION ACTIVITIES

Communication methods have been developed to inform others about the Project and its success. The information tools have been used by the Auto Companies, AAMA, and members of the Advisory Group at various conferences and displays. Examples of these communications include:

- Brochure describing the highlights of the US Auto Project
- Slide presentation describing the US Auto Project

As part of the US Auto Project, AAMA co-sponsored the National Pollution Prevention Roundtable held in Cincinnati in April 1998. Auto Companies provided exhibits of advanced alternative fuel technologies including electric vehicles.

III. ACCOMPLISHMENTS

GREAT LAKES PERSISTENT TOXIC SUBSTANCES (GLPTs)

The US Auto Project focused on GLPTs. The list of the GLPTs is in Appendix A. Table 3 provides a summary of the combined Auto Company GLPT reported releases from 1988 through 1997.

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Metals										
Antimony and Compounds	8,528	14,979	147,520	7,087	959	535	798	959	1316	887
Arsenic and Compounds	0	0	2,057	1,459	833	1,431	1,238	0	0	0
Cadmium and Compounds	0	0	6,605	1,950	1,065	752	10,324	0	0	0
Chromium and Compounds	773,361	686,560	2,189,534	522,064	417,204	412,231	565,897	498,191	261,616	352,893
Copper and Compounds	807,098	470,361	312,029	815,130	240,241	479,542	935,914	597,320	313,580	574,547
Lead and Compounds	562,142	706,927	546,187	353,123	246,326	332,411	467,088	582,740	386,304	653,023
Nickel and Compounds	1,276,663	904,073	1,575,294	411,015	361,020	303,046	225,178	257,398	178,788	203,283
Silver and Compounds	0	0	0	58	305	0	0	0	215	38
Zinc and Compounds	4,534,793	10,960,560	8,625,601	9,239,649	7,586,512	6,856,665	10,264,742	16,405,237	14,836,330	13,496,330
Group sub-total:	7,962,585	13,743,460	13,404,827	11,351,535	8,854,465	8,386,613	12,471,179	18,341,845	15,978,149	15,281,001
Halogenated HCs										
1,2-Dibromomethane	0	0	0	0	0	0	0	0	0	0
Dichloromethane	2,601,297	1,707,055	901,840	562,929	397,745	409,698	281,145	304,059	86,847	41,660
Tetrachloroethylene	2,355,949	1,466,102	1,688,793	652,540	187,950	119,418	126,015	144,211	141,235	32,000
Trichloroethylene	3,182,851	3,050,498	1,093,485	1,980,579	1,588,114	1,737,590	1,276,730	923,570	585,900	518,580
Group sub-total:	8,140,097	6,223,655	3,684,118	3,196,048	2,173,809	2,266,706	1,683,890	1,371,840	813,982	592,240
Non-Halogenated HCs										
Benzene	107,797	59,705	68,447	67,100	30,056	24,726	255,880	186,686	249,937	220,333
Butyl benzyl phthalate	499	16,597	0	8,917	3,068	2,200	0	0	0	0
Di-(2-ethylhexyl) phthalate	15,300	26,440	20,715	32,956	22,414	17,567	8,520	8,445	5,074	3,413
Dibutylphthalate	14000	58,257	30,824	2580	70,110	80,002	0	0	0	0
Diethylphthalate	31,324	13,896	8,505	0	0	0	0	0	0	0
Ethylbenzene	1,204,417	1,465,173	1,755,539	1,815,996	1,687,435	2,368,520	3,346,628	2,548,783	2,552,470	2,265,322
Naphthalene	17,486	48,131	52,104	35,425	24,979	327	461	54,994	140,192	140,145
Phenol	503,084	167,880	104,914	159,907	165,611	368,725	277,678	243,356	204,576	180,539
Polychlorinated biphenyls	76,455	0	0	0	0	0	0	0	0	0
Toluene	9,189,689	8,901,179	4,826,796	3,625,983	3,337,454	3,128,790	3,053,982	1,465,977	1,412,187	1,276,392
Group sub-total:	11,160,051	10,757,258	6,867,844	5,748,864	5,341,127	5,990,857	6,943,149	4,508,241	4,564,436	4,086,144
Total Reported GLPTs:	27,262,733	30,724,373	23,956,789	20,296,447	16,369,401	16,644,176	21,098,218	24,221,926	21,356,567	19,959,385

Since 1991, aggregate releases of many of the listed GLPT substances from Auto Company facilities (as reported in the annual US EPA Toxic Release Inventory (TRI) report) have declined. See Figure 1.

Foundries recycling zinc galvanized metal accounted for over 50 percent of the total US Auto Project GLPT substance¹ releases in 1997. GM foundries have increased their use of recycled scrap sheet metal that contain higher quantities of zinc. Higher zinc TRI releases are due to the increased reliance on the recycling of galvanized steel for body panel corrosion protection. When normalized for vehicle production volumes, overall releases of GLPTs have decreased by 17.9 percent since the last Progress Report (1995) and by 25.5 percent, since the Project began in 1991. See Figure 2. If the reported releases of zinc at the foundries are excluded from the data, releases of GLPTs decreased by 63.6 percent since 1991, when normalized for vehicle production volumes.

¹ One GM foundry accounted for zinc TRI releases of 11.87 million pounds in 1996 and 10.57 million pounds in 1997.

Figure 1. GLPT Reportable Releases for AAMA Member Company US Facilities

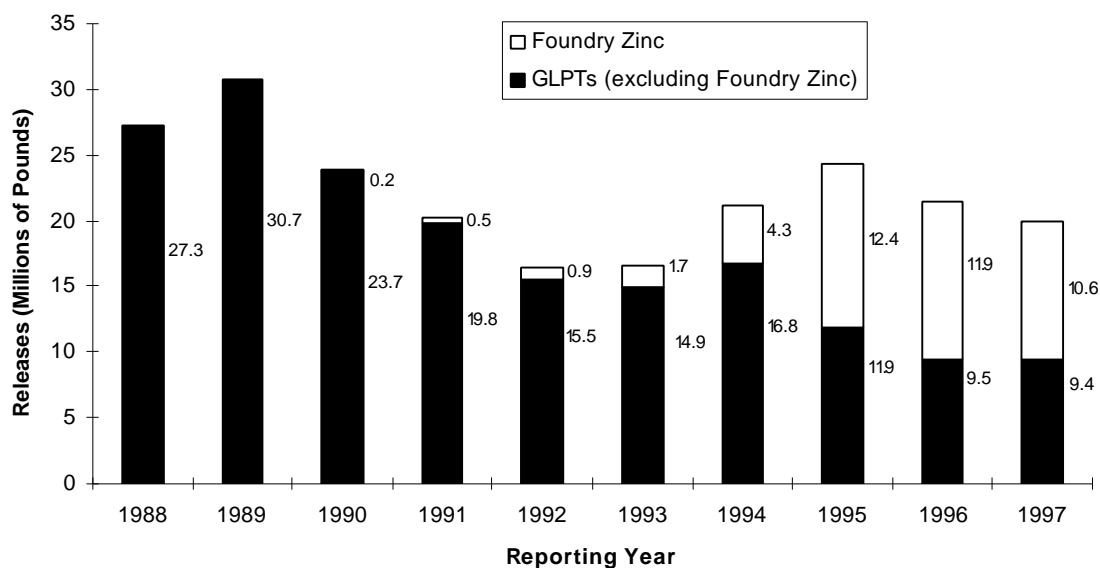


Figure 2. Production Normalized GLPT Reportable Releases for AAMA Member Company US Facilities

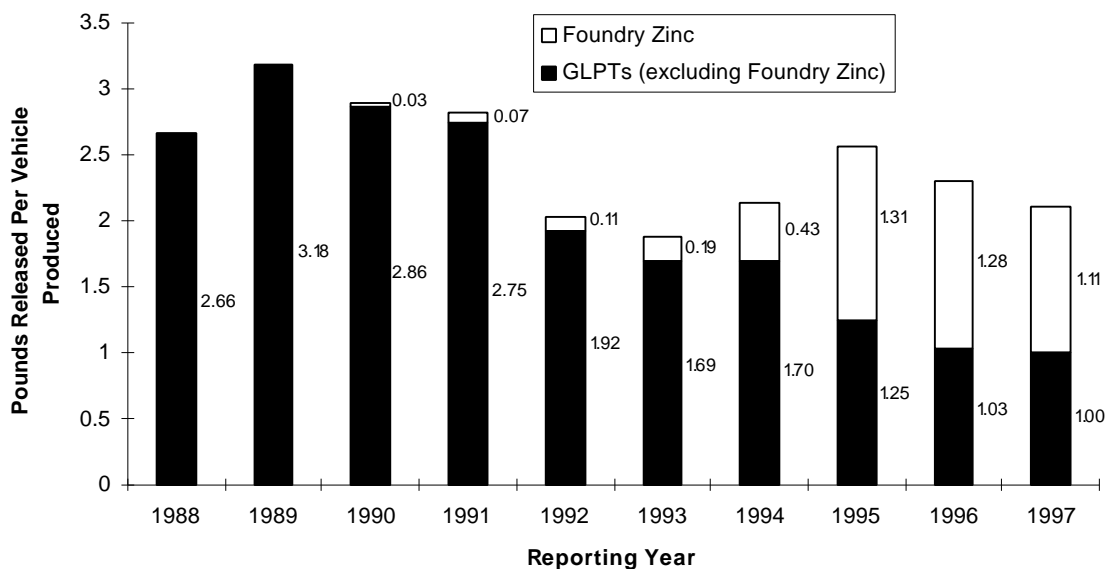
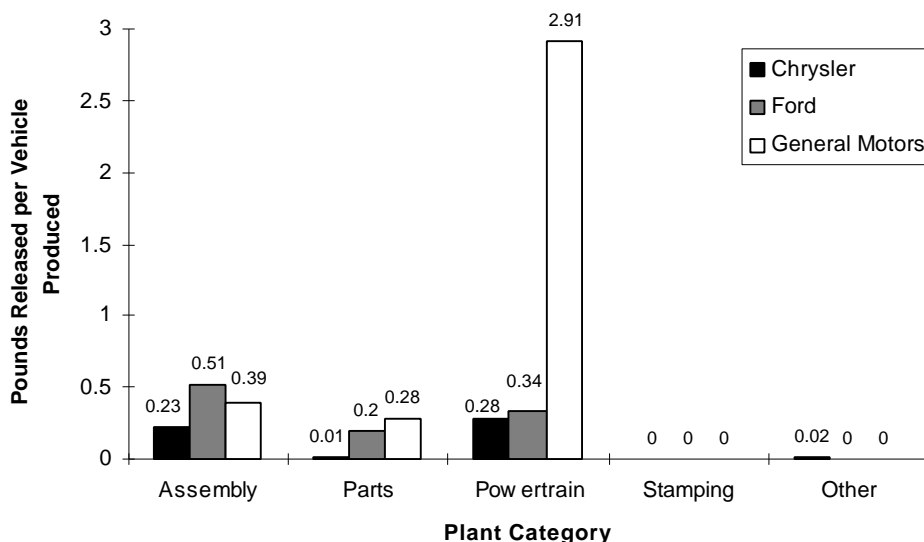


Figure 3 reflects the production normalized distribution of GLPT releases during 1997 by plant category for each Auto Company. Powertrain plants, which include foundry and machining operations, report metals such as zinc. Painting operations and paint solvent use are

associated with assembly plants. Parts plants generally report releases from cleaning or painting solvents, with some releases of metals, depending on the parts being produced.

Opportunities to install newer and cleaner technologies and/or control equipment that minimize releases primarily occur when a new plant is built or when older plants are significantly refurbished during major program or model upgrades.

Figure 3. 1997 GLPT Production Normalized Reportable Releases by Plant Category for AAMA Member Company US Facilities



Individual Chrysler, Ford, and General Motors data are provided in separate sections. When reviewing individual company data, it is important to keep in mind the relative size differences, specifically the number of parts plants, among the companies. For example General Motors has 38 parts plants in the US, Ford has 14, and Chrysler has 7. In the US, there were 30 Chrysler, 50 Ford, and 91 General Motors facilities that submitted US EPA TRI data for 1997. A list of each company's reporting plants can be found in Appendices C, D, and E.

TOXIC RELEASE INVENTORY (TRI) RELEASES

Since 1988, Chrysler, Ford, and General Motors together have achieved a 63 percent reduction of EPA TRI releases. See Figure 4. On a production normalized basis, a 60 percent reduction has been achieved. See Figure 5. These reductions have been mainly accomplished through the use of specific pollution prevention actions, process improvements, and recycling as described in the case studies outlined in the table in Appendix G. Other release reductions have been achieved through the use of control equipment and treatment processes. (See Appendix F, Combined AAMA Member Company Data)

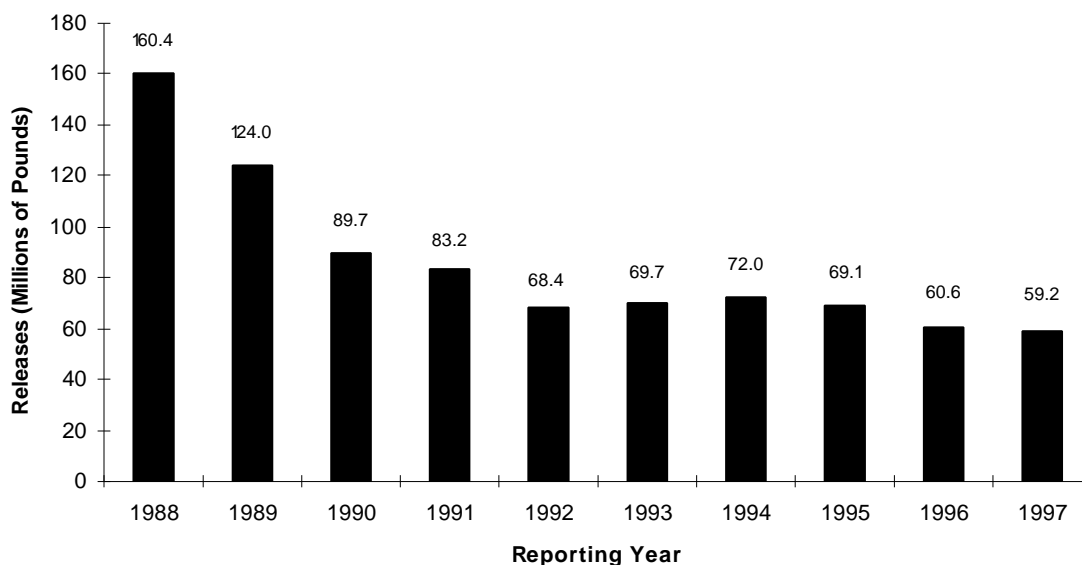
Over the years there have been several changes in TRI reporting requirements that have affected the reported values. Beginning in 1996, TRI metals sent to POTW's for off-site treatment and metals sent for stabilization or solidification were to be reported as TRI releases: previously they were reported as treated. Additionally, changes in lists of reportable chemicals,

threshold and de minimis levels, and exemptions make it difficult to compare the data from year to year.

Source reduction is the preferred method to reduce releases. Based on the evaluation of all factors relating to technical and economic feasibility and product requirements, recycling, energy recovery, treatment or disposal are also utilized.

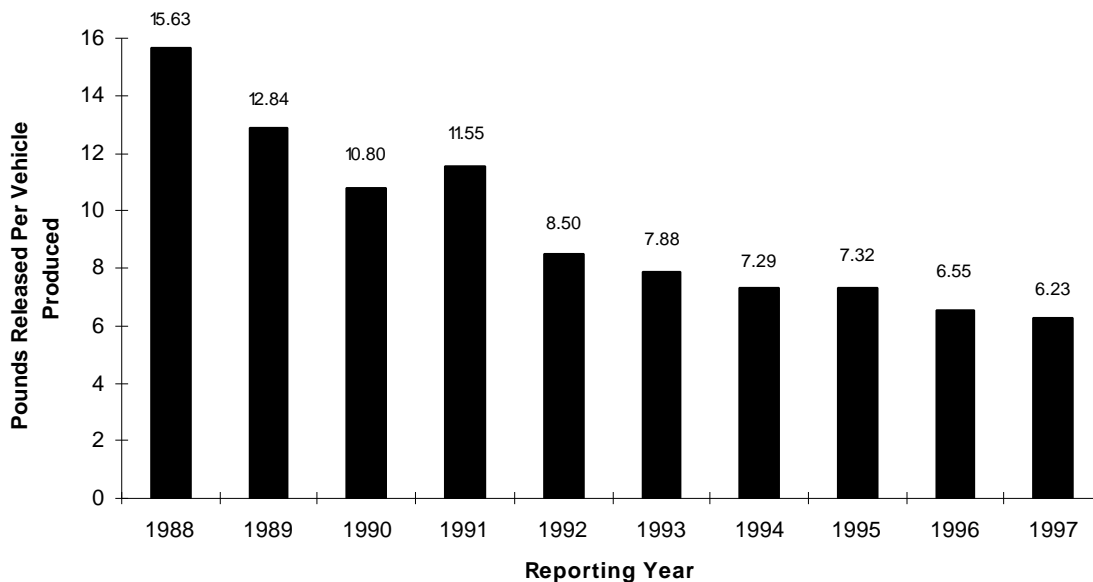
The TRI data in this section of the report details GLPTs released from all AAMA Auto Company US operations. Data from the TRI is utilized because the TRI is an accepted reporting mechanism in the US for which company facilities have well established systems to collect and report information. The data presented in Appendix F represents detailed TRI release totals from all three Auto Companies by type of operation, i.e., assembly, parts and components, powertrain, stamping, and other facilities. The quantities of GLPTs transferred to recycling, treatment and energy recovery are also included.

**Figure 4. Total TRI Reportable Releases
for AAMA Member Company US Facilities**



The Pollution Prevention Act of 1990 required that beginning in 1991, TRI listed substances which are recycled as fuel for energy recovery, previously exempt, also were to be reported in the TRI. In an effort to compare actual releases year to year, recycling and energy recovery data are not included in Figures 4 and 5. These data are included in Appendix F.

**Figure 5. Production Normalized TRI Reportable Releases
for AAMA Member Company US Facilities**



BINATIONAL TOXICS STRATEGY (BNS) IMPLEMENTATION SUBSTANCES

The Great Lakes Water Quality Agreement, signed 25 years ago by Canada and the US, set a goal to virtually eliminate discharges of persistent toxic substances to the Great Lakes. In 1993, a task force assembled by the International Joint Commission, the binational body charged with monitoring progress under the Agreement, established a virtual elimination protocol. In 1997, building on this IJC protocol, Environment Canada and EPA established the Great Lakes Binational Toxics Strategy as their implementation tool.

The Great Lakes Binational Toxics Strategy is an agreement signed by EPA and Environment Canada to take specific steps towards achieving the goal for the program. There are 16 designated Level I substances. The Strategy also seeks to reduce 21 additional, Level II substances through pollution prevention efforts. Level I and II substances are listed in Appendix B. Each Auto Company addresses these substances in more detail in their respective section. The Binational Toxics Strategy is a voluntary program.

IV. FUTURE DIRECTION

As the current structure of the Project concludes, it is important to reflect on some of the characteristics and successes of the US Auto Project. These included:

- Was the first voluntary pollution prevention partnership between an industry sector and government
- Established a Project Mission Statement and Operating Guidelines

- Established an external Advisory Group of diverse stakeholders to provide guidance and counsel to the Project
- Provided public accountability through publication of four progress reports
- Published 78 Chrysler, Ford, and General Motors pollution prevention case studies
- Published five joint intern pollution prevention case studies for use in higher education curricula
- Encouraged automotive suppliers to adopt cost effective pollution prevention practices within their facilities to reduce the use, generation and release of persistent toxic substances and other materials of concern
- Achieved combined Chrysler, Ford, and General Motors progress:
 - 26 percent reduction in reportable releases of Great Lakes Persistent Toxic substances (GLPTs) on a vehicle produced basis since the Auto Project began in 1991
 - 63 percent reduction in GLPTs (excluding foundry zinc releases) on a vehicle produced basis since the Auto Project began in 1991
 - 46 percent reduction of EPA Toxic Release Inventory (TRI) reportable releases on a vehicle produced basis since 1991 and 60 percent reduction from the 1988 baseline year established for TRI
 - Commitments to reduce the use and release of Binational Toxics Strategy Implementation Substances (BNS), particularly mercury and polychlorinated biphenyls (PCBs). See Chrysler, Ford and GM sections for specific details.

Chrysler, Ford and GM have established their respective environmental policies or principles that guide their business decisions and support environmental improvements. Additionally, Chrysler, Ford and GM are implementing environmental management systems, design for the environment programs and life cycle management systems. With the conclusion of the current US Auto Project structure, the Auto Companies will also continue to report publicly on their environmental progress and to participate in federal and state voluntary pollution prevention programs.



V. CHRYSLER CORPORATION

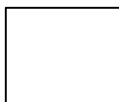
PROJECT STATUS

As a participant of the US Auto Project, Chrysler Corporation recognizes the benefits of pollution prevention to both the environment and the Corporation. Chrysler considers pollution prevention as a way of doing business. Over the years Chrysler has successfully initiated a number of pollution prevention initiatives that have resulted in reduced releases of reportable substances.

Table 4. Summary of Chrysler Corporation US Auto Project Overview Data										
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
No. of Vehicles Produced in US	1,618,279	1,567,038	1,252,365	1,056,193	1,282,896	1,427,555	1,695,508	1,718,684	1,702,459	1,705,653
GLPTs Released (lbs)	2,018,433	1,656,252	842,517	795,335	780,176	959,503	968,307	831,286	828,457	927,493
Total TRI Released (lbs)	18,832,332	17,810,283	7,992,547	6,795,376	6,192,632	6,322,017	6,286,835	5,727,395	5,014,408	4,368,506
GLPTs (lbs) per Vehicle Produced	1.25	1.06	0.68	0.75	0.61	0.67	0.57	0.48	0.49	0.54
TRI (lbs) per Vehicle Produced	11.64	11.37	6.38	6.43	4.83	4.43	3.71	3.33	2.95	2.56

Between 1988 and 1997, Chrysler Corporation reduced releases of TRI chemicals by 78 percent on a production normalized basis. Looking at releases on a total weight basis, the reduction exceeds 76 percent. In 1991, the first year that reporting of recycling and energy recovery data was required, the combined total of releases and off-site transfers including recycling and energy recovery was 12.2 million pounds or 11.6 pounds per vehicle built. By 1997, this had dropped by 56 percent to 5.4 pounds per vehicle. And, of this, over 58 percent was beneficially re-used through recycling and energy recovery programs.

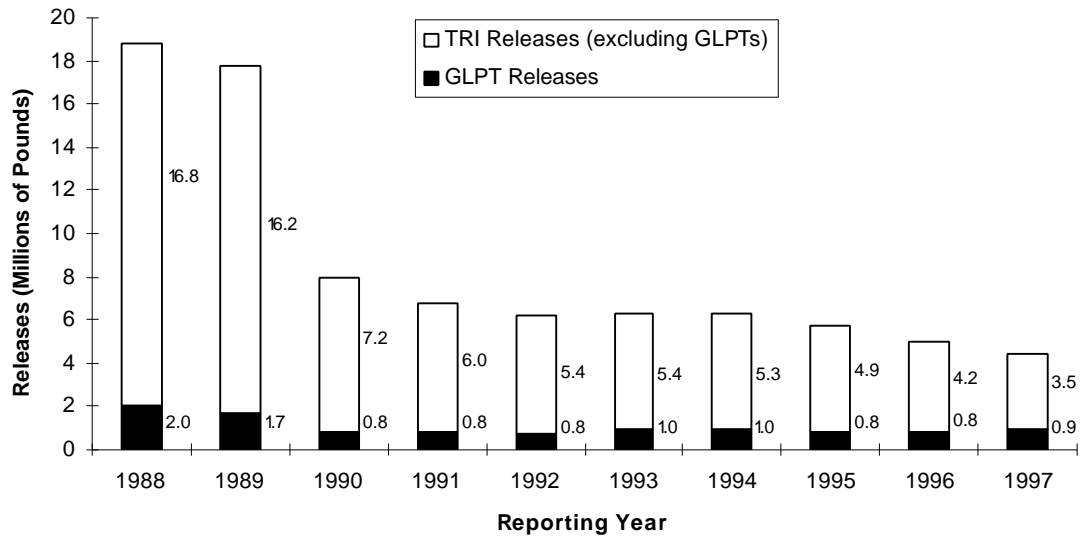
Relative to the chemicals specifically tracked by the Auto Project, between 1988 and 1997, releases fell by 54 percent to about half a pound per vehicle produced. Halogenated



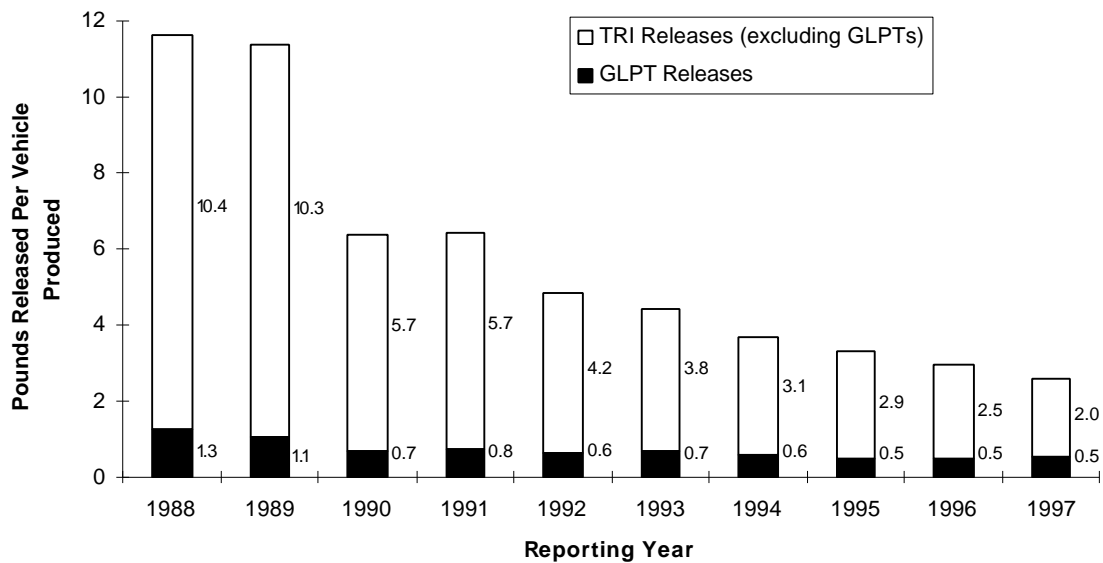
substances have been eliminated. Of the ten non-halogenated substances tracked by the Auto Project, releases of all but ethylbenzene have fallen by well over 90 percent. Ethylbenzene is a trace contaminant in gasoline. It is also a trace contaminant in commercial grade xylene and is therefore present in purge solvents and paints which contain xylene. Used purge solvent is increasingly being recycled and reused to replace virgin products. We anticipate levels of ethylbenzene to drop in the future as we reduce the use of solvents, particularly Hazardous Air Pollutants (HAPs).



**Figure 6. GLPT Substances Included in Total TRI Reportable Releases
(Chrysler Corporation US Facilities)**

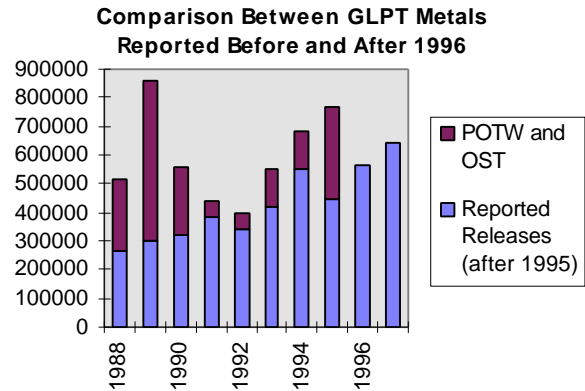


**Figure 7. Production Normalized GLPT Reportable Releases
(Chrysler Corporation US Facilities)**





US EPA has changed the reporting requirements for metals many times over the years making interpretation of this data difficult. In 1996, EPA required metals in POTW discharges and off-site treatment to be reported as “released” instead of “treated”. Prior to 1996, these metals were reported as “treated”. Therefore, when looking at the trend for metals, to get a true comparison, one must look at the total of releases plus off-site transfers, not just releases. This data shows that between 1995 and 1997 metals have gone down.



Reductions in the Auto Project and TRI chemicals have been achieved through successful implementation of P2 initiatives at many Chrysler plants including:

- Water based production and non-production paints
- High transfer efficiency paint spray application equipment
- Reformulation of paints and cleaning solvents
- Replacement of chlorinated solvent degreasers with aqueous parts washers
- Chrome free phosphating systems at Chrysler assembly plants
- Lead free electrocoat primers
- Minimizing usage of purge solvents through block painting and other techniques
- Powder anti-chip coatings
- Screening and eliminating the use of restricted chemicals in non-production materials
- Installation of second stage vapor recovery for gasoline fill systems
- Reformulation of sealers, adhesives and mastic compounds

Binational Toxic Substances (BNS). Most of the BNS substances are rarely used at Chrysler plants. Of those listed, Mercury, PCBs and cadmium are a concern.

Mercury is present in some switches, instruments, small batteries and lighting ballasts. Chrysler has programs in place to segregate these types of articles at the end of their useful life and ship them to special facilities where the mercury is removed and reclaimed. To reduce the usage of mercury, standards for new equipment have been modified to eliminate mercury where possible. Also, as an example, Chrysler is evaluating the use of mercury-free blood pressure measurement equipment in its clinics. Chrysler vehicles are virtually mercury-free.

Polychlorinated biphenyls (PCBs) are also a Level I BNS. PCBs are a class of chemicals that have been used as coolants and flame retardant fluids in high voltage electrical equipment such as transformers and capacitors. Chrysler developed a program in the early 1980's that established a goal to eliminate PCB containing equipment from all of its facilities by the end of 1998. This program included PCB transformers; PCB contaminated transformers, large PCB capacitors, and PCBs from mineral oil filled switches. Chrysler will be virtually PCB-free by the end of 1998.



Level II BNS include cadmium and cadmium compounds. Since 1993, Chrysler has had a program to eliminate cadmium (among other chemicals) from non-production parts being used in the facilities. Chrysler has also instituted a program to reduce and/or eliminate cadmium in the vehicles it produces. In these programs, vendors that are suppliers to Chrysler are required to disclose the presence of substances, like cadmium in the material they plan to supply so that substitutes may be used where feasible.

Chrysler case studies document specific projects related to reduction in Auto Project, TRI and BNS chemicals. These case studies include critical success factors, including barriers that have been encountered, relevant to achieving significant improvements and reductions. Copies of these completed studies have been published during the course of the Auto Project on the Michigan Department of Environmental Quality web site and have been distributed throughout the company as well as suppliers.

ACTIVITIES AND ACCOMPLISHMENTS

Accomplishments

Chrysler has received external recognition many times for its progressive Pollution Prevention programs, including the following recent awards:

- Sterling Heights Assembly Plant was one of the first three facilities in Michigan to receive the Clean Corporate Citizen Award (1997) from the Michigan Department of Environmental Quality. To qualify for this designation, the facility must demonstrate environmental excellence in three areas: strong pollution prevention programs that target elimination or reduction at the source, responsible and effective environmental management, and consistent compliance with all applicable environmental requirements.
- St. Louis North Assembly Plant was awarded the Missouri Governor's Award for its Pollution Prevention accomplishments in 1997.
- In 1997, Belvidere Assembly Plant received the Illinois Governor's Award for Pollution Prevention accomplishments for the fifth time in six years. The plant also received the Illinois EPA STAR Partner Award in 1997 for Pollution Prevention, and in 1996 received Special Recognition from the Governor for sustaining their Pollution Prevention Program.
- The New Castle Chassis Systems plant in Indiana received the Three Rivers Solid Waste Management District Award for Outstanding Efforts in Waste Reduction in 1997.
- Both the Toledo Assembly Plant and Toledo Machining Plant were recipients of the Ohio Governor's Award for Outstanding Achievement in Pollution Prevention in 1996.
- US EPA recognized Chrysler in 1996 for exhibiting Sustained Leadership in Waste Prevention relative to Chrysler's commitment and success in the Waste Wise Program.

Ongoing Activities

Manufacturing Environmental Policy. In 1998, Chrysler Corporation implemented a new manufacturing environmental policy that clearly states Chrysler's commitment to operating in an environmentally responsible manner. It emphasizes goals of continuous improvement in the environmental performance of both processes and products. The following principles are iterated in the new policy: (1) commitment to integration of sound environmental practices, (2) the role of employees and suppliers in minimizing environmental impact, (3) pursuit of development and implementation of environmentally superior materials, technology and



management methods, (4) assessment of environmental implications of new products, processes, materials, and facilities (5) establishment, measurement, and reporting on the status of environmental goals, and (6) implementation of this Policy through the Manufacturing Quality Assurance System.

Planning. Each Chrysler facility is required to prepare an annual P2 Plan. The plans are a tool for identifying and prioritizing measurable waste reduction and cost savings opportunities, as well as providing a means to develop and implement these opportunities. These plans identify waste streams, and usage of regulated substances so that goals can be set to reduce and/or eliminate them. A cross functional team at the plant conducts regularly scheduled meetings to establish the goals, develop assignments for accomplishing the goals, and to report on progress in meeting these goals. Life Cycle Management Analysis (LCM) is an integral part of the planning process. LCM takes into consideration a product or material throughout its life cycle from acquisition, through processing, to disposal, and includes the long term costs and liabilities associated with that product or material. One example of using LCM is closed loop recycling of waste plastic film. Manufacturing plants, particularly assembly plants, receive parts, materials, components and other items that are packaged in plastic film that is used to protect and secure the item being shipped. Chrysler plants collect, segregate and ship this waste film to a reclaimer. The reclaimer reprocesses the film into recycle content plastic trash can liners that are then sold to Chrysler plants at a significant savings over new trash can liners. The program saves money and keeps the plastic film from being landfilled.

Recognition of Achievement. Beginning in 1994, Chrysler has sponsored a program referred to as CHEER, or **Chrysler Honors Environmental Excellence with Recognition**. The mission of CHEER is to promote environmentally sound policies and practices within Chrysler by providing recognition to those whom have reduced or eliminated sources of pollution in their daily operations. Eligibility for CHEER is based upon any team or individual associated with Chrysler who contributes to pollution prevention or environmental improvements at Chrysler. From 1996 to 1998, a total of 203 nominations have been received with 19 awards presented. Awards are presented to the winners at Chrysler's Annual Environmental Seminar.

Voluntary Initiatives. Chrysler Corporation has been a partner in Waste Wise since 1994. This is an EPA sponsored program to reduce municipal solid waste. Goals are set for waste prevention, recycling, collection, and buying or remanufacturing recycled products. Chrysler also participates in the development of the Michigan Business Pollution Prevention Partnership, and currently serves on the technical and communication workgroup of this Partnership to assist and recognize Michigan businesses that commit to pollution prevention activities. At the National Pollution Prevention Center located at the University of Michigan, Chrysler serves on the Advisory Board to provide advice concerning pollution prevention education and curriculum development, the internship program and research initiatives. Many Chrysler facilities also participate in local or state led initiatives.

Teamwork. At Chrysler, teamwork is key to successful implementation of P2. Two key teams are PQI and FEDT.

The PQI (Product Quality Improvement) team is a joint UAW and Chrysler management team whose purpose is to reduce the amount of solid waste being sent to landfills. The team committed to a stretch goal of zero waste to landfill by the year 2000 and has been



aggressively implementing some very successful programs to segregate and recycle metals, cardboard,

plastic, wood, and paper. As a result, in 1997, more than 46 million pounds of cardboard, 6 million pounds of plastic, and 55 million pounds of wood were recycled.

The FEDT (Facility Environmental Design) team supports Advanced Manufacturing Engineering project managers during construction of major new facilities to assure inclusion of the best environmental technologies in the new facility. Six major manufacturing facilities, constructed since 1990 have been designed and built using this program and the seventh, the new Jeep Assembly plant in Ohio is underway. Key features include:

- Specification of environmentally responsible materials for both new production processes and for construction of the facility itself
- Maximizing efficient use of materials, thereby minimizing waste
- Safe storage and use of oils and chemicals on site, with state-of the art spill containment systems for delivery, storage and handling
- Second stage recovery for volatiles in tank farms
- Extensive use of durable, reusable shipping containers to minimize solid wastes
- Specifying non-CFC materials for drinking fountains, fire systems and HVAC systems
- Energy Conservation
- State-of-the-art waste water treatment facilities

Technology Transfer. The integration of P2 and Life Cycle Management into business operations at Chrysler continues to reap benefits. In addition to the P2 Case Studies mentioned above, there is an Electronic Bulletin Board which is used by Chrysler employees to communicate both the successes and pitfalls associated with new technologies and materials. Technology that is proven to be technically and economically feasible as well as that which is not is encouraged to be posted. Funding for P2 pilot projects and new technology development is forecast and budgets are provided in the company's 5- year Environmental Spending Plan. Furthermore, each year such projects are shared at the annual environmental seminar and through the CHEER program.

FUTURE DIRECTION

Environmental Management System. Chrysler is enhancing its Environmental Management System, integrating it into the Manufacturing Quality Assurance System. This system will provide a strong framework for managing environmental programs at manufacturing facilities. Key elements of the program include:

- A policy statement
- A facility environmental strategy and pollution prevention team
- Incorporation of environmental goals into the facility business plan
- Clear process ownership and responsibility throughout the plant organization
- Checklists to "error proof" compliance programs
- Standard operating procedures and flow diagrams for environmental operations
- A standardized facility environmental measurement and reporting system
- An environmental education program
- Development of an environmental calendar



The EMS will provide full integration of environmental processes into daily operations at each manufacturing plant.

Facility Environmental Design Team. This effort will continue to be an important part of Chrysler's strategic approach to pollution prevention - improving environmental performance in the future by incorporating the latest technologies in Chrysler's newest plants.

Life Cycle Management. Concepts of life cycle management will continue to be applied to products, processes and facilities at Chrysler in the future. This is a proactive approach that assures good business decisions are good environmental decisions.



VI. FORD MOTOR COMPANY

PROJECT STATUS

Since 1991, when the US Auto Project was initiated, Ford Motor Company has implemented process improvements that have reduced the use and release of reportable substances and provided benefits to the environment and to Ford. Reductions in the release of these substances have occurred while vehicle production volume has increased and the number of reportable substances listed under the US EPA Toxic Release Inventory reporting requirements has nearly doubled to more than 600 substances.

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
No. of Vehicles Produced in US	3,572,549	3,381,924	2,929,779	2,564,814	3,009,331	3,339,293	3,734,282	3,453,467	3,538,974	3,518,607
GLPTs Released (lbs)	6,509,704	8,650,380	5,256,045	6,102,939	5,938,464	6,806,958	7,053,075	4,747,226	4,187,307	3,706,692
Total TRI Released (lbs)	37,137,131	36,391,332	25,701,321	23,894,096	22,466,591	26,021,069	27,266,892	22,541,329	20,641,131	19,682,673
GLPTs (lbs) per Vehicle Produced	1.82	2.26	1.79	2.38	1.97	2.04	1.89	1.37	1.18	1.05
TRI (lbs) per Vehicle Produced	10.40	10.76	8.77	9.32	7.47	7.79	7.30	6.53	5.83	5.59

As shown in Table 5, overall reportable releases of all US EPA Toxic Release Inventory (TRI) substances have been reduced by 47 percent since 1988. On a production normalized basis, releases were reduced by 46 percent, or from 10.4 pounds of reportable releases per vehicle produced in 1988 to 5.59 pounds per vehicle produced in 1997.

Since the previous US Auto Project progress report, which provided data through 1995, Ford has reduced reported releases of TRI substances and Great Lakes Persistent Toxic (GLPT) substances by 11.9 percent, and 21.9 percent, respectively, based on the TRI data reported for 1997.

The US Auto Project has been important to Ford as it has helped to:

- identify manufacturing processes and product components where reportable substances have been used,
- prioritize the reduction in use of these substances where practicable, and
- expedite the integration of proactive environmental considerations into the earliest stages of product development.

Simultaneous to this project, Ford has implemented an Environmental Management System (EMS) and has committed to achieving ISO 14001 certification for its manufacturing facilities



worldwide (ISO 14000 is an international standard for an EMS). Currently, 90 Ford facilities are certified, including 49 facilities in North America (32 in the US, 9 in Canada, and 8 in Mexico). It is expected that 140 Ford manufacturing facilities worldwide will be ISO 14001 certified by the end of this year. Inherent elements of ISO 14001 registration are commitments to continuous improvement and to prevention of pollution.

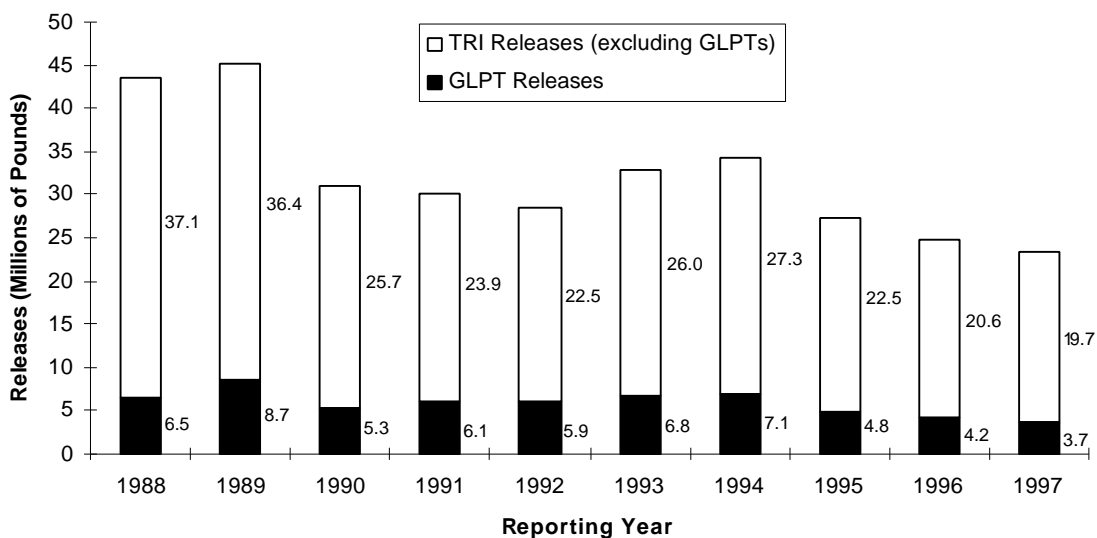
Additionally, Ford has recently:

- eliminated chromium-based coating in nearly all assembly plant pre-paint processes worldwide,
- installed dry machining in applicable selected machining processes (dry machining does not use oil or oil/water mixture for lubrication during machining, such as drilling or cutting metal),
- implemented a global Design for Environment (DFE) process training program,
- increased the use of reusable / returnable packaging for materials supplied to assembly plants and powertrain manufacturing facilities.

To assist in the reduction of substances listed in the US and Canada Binational Strategy agreement, Ford has also committed to eliminate mercury use in all vehicle switches in upcoming vehicle lines and to eliminate PCB containing transformers from Ford facilities by the year 2010.

As demonstrated in Table 5, and the following chart, Ford has reduced the release of the GLPT substances by 39 percent since the Auto Project was initiated in 1991.

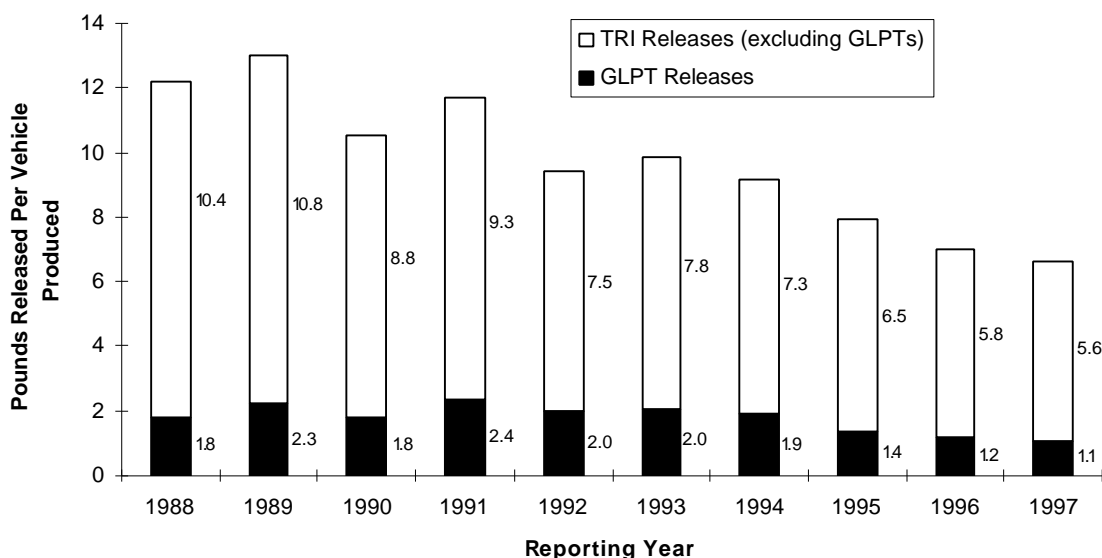
**Figure 8. GLPT Substances Included in Total TRI Reportable Releases
(Ford Motor Company US Facilities)**





The quantity of GLPT substances released per vehicle since 1991 has been reduced from 2.38 to 1.05 pounds per vehicle, a reduction of 55 percent. While this reduction occurred, the US production of Ford vehicles increased.

**Figure 9. Production Normalized GLPT Reportable Releases
(Ford Motor Company US Facilities)**



One important reason for reductions of the total release of TRI reportable substances and of GLPT substances is the change in specific manufacturing processes that previously used chlorinated solvents.

The release of a few substances has increased. The change in reporting requirements, as mentioned in an earlier section of this report, now requires that residuals of metals, such as zinc, nickel, lead, chromium, that are discharged to the public sewer for further treatment by the municipal system, be reported in the release category and not be reported in the off-site treatment category.

In a few cases, important product improvements required the use of certain substances. For example, nickel releases have increased from 39,000 pounds in 1988 to 53,000 pounds in 1997. A primary reason for this increase is to achieve ten year rust protection for the body of vehicles manufactured by Ford.

Nickel is an important coating additive when zinc-galvanized steel is used to enhance customer value and reduce future body repair and repainting. A few parts per million of residual nickel is rinsed from the part and is removed from the wastewater with other materials, such as iron, as a waste sludge. The very low concentration of nickel is disposed of with the other non-hazardous sludges into an industrial landfill. Ford has researched and is piloting nickel-free options that have the potential to provide the same positive protection against corrosion without the use of nickel.



The application of the cold curing process at foundries results in a greater use of naphthalene and phenol, but reduces the use of methanol. The release of benzene, which also increased, is a by-product of the foundry core manufacturing process.

ACTIVITIES AND ACCOMPLISHMENTS

Accomplishments

Reducing use and release of chlorinated solvents. Ford has continued its progress toward eliminating the use of chlorinated solvents for heat exchanger cleaning and paint stripping processes. Trichloroethylene (TCE) use has been eliminated where technically and economically possible and reportable TCE release has been reduced from more than 2 million pounds per year to less than 0.5 million pounds per year. Reportable releases of tetrachloroethylene have been eliminated. Methylene chloride (dichloromethane) releases have been reduced by nearly 94 percent, from over 660,000 pounds in 1988 to 42,000 pounds in 1997. Overall, there were approximately 2.6 million pounds of reported releases of GLPT listed chlorinated solvents in 1988 and less than 0.52 million pounds in 1997. This represents an 80 percent reduction in release of these substances.

Mercury Reduction. In our voluntary commitment to the Michigan Mercury Pollution Prevention Task Force, Ford agreed to eliminate mercury containing switches in new vehicle lines as soon as practicable. In this effort, Ford has reduced the number of mercury switches in its vehicles by 1.4 million from 1996 to 1997. This action supports the Binational Toxics Strategy (BNS) between the US and Canada.

Reduced Hydrocarbon Emissions. Reductions in the reported release of non-halogenated solvents, such as xylene, ethylbenzene, and methyl isobutyl ketone, have occurred primarily due to changes in paint formulations, increased number of controls and absorption systems and changes in cleaning practices for paint lines, equipment and the painting area.

Annual Environmental Review. The Ford 1998 Environmental Review provides more information on Ford's overall environmental progress in products and manufacturing processes.

Ongoing Activities

Technology Transfer. Ford personnel continue to provide case study information on waste reduction and pollution prevention opportunities and processes at non-Ford business and professional forums, seminars and workshops. Case studies that outline specific pollution prevention actions have routinely been provided to the AAMA for distribution to interested parties, including suppliers and other industries. The Michigan Department of Environmental Quality also receives these case studies and makes them available on their internet web page.

Ford has provided external advisory support to the National Pollution Prevention Center (NPPC) at the University of Michigan since the origination of the program in 1991, and will continue to provide support for its replacement organization, the Center for Sustainable Systems. Ford has provided significant financial support to the NPPC as well as to many other



universities in Michigan and throughout the US. Students and university personnel develop case studies based on their work with Ford and share non-proprietary environmental information and process improvements with other educators and industries.

Ford also has a student intern program for upperclassmen and graduate level students. About 25 to 30 students with chemical and/or environmental engineering majors are challenged each

summer with assignments in the environmental and research areas. The students selected come from several different universities.

Internal Training. Ford has placed its internal waste minimization / pollution prevention guidebook on an internal web system for access by all Ford waste prevention teams world wide. Design for the environment and vehicle recycling training are now available globally, and a Design for Environment internal web page provides process tools for engineering personnel and has links to other internal environmental guidance documents and specifications. This training is also provided to specific program teams and is available to primary suppliers and others who work with the program teams. Vehicle recycling training supports the Company objective to increase the recycled content and recyclability of Company products. The training focuses on recyclable materials and includes case studies demonstrating how recycled materials have been incorporated into Ford products.

PCB Phase-out. The global phase-out of PCB containing transformers continues and is scheduled for completion by year 2010. This action also supports the BNS between the US and Canada.

WasteWise. Ford is a charter member of the US EPA WasteWise program. The activities include solid waste prevention and reduction, recycling, and purchasing of recycled products. In 1996, Ford received a commendation from the US EPA for its "Comprehensive Waste Reduction Program". In addition, in December, 1996, Ford received the Keep America Beautiful "Award of Excellence", and in October, 1998, Keep America Beautiful again recognized Ford with its highest award, the "Vision for America" award, for environmental leadership and Ford's achievements in recycling.

Ozone Action in Southeast Michigan. Ford uses an internal communications network to alert employees of ozone action days and to provide information on how to minimize low level ozone. The messages are distributed via internal computer and video communications systems. An "Ozone Action" video was developed and is aired on ozone action days.

ISO 14000. As mentioned earlier, Ford has committed to achieving ISO 14001 environmental management system certification at each manufacturing facility worldwide and plans to complete the process by the end of this year.

Low-emissions Painting Processes. The Ford Wixom plant is host to the low-emissions paint pilot facility, where representatives of USCAR (Ford, Chrysler, GM), with paint and equipment suppliers, are working to develop high volume, production-ready, paint processes that use very little solvent (e.g., powder coating systems) in the operation, cleaning and maintenance of the process.



FUTURE DIRECTION

The Auto Project has provided Ford with a solid framework for better understanding voluntary collaborative environmental programs. With the anticipated dissolution of the AAMA and the end to the current Auto Project, Ford will continue to pursue its environmental activities in a manner consistent with its strategy to lead in corporate citizenship.

Ford direction includes:

1. completing the establishment of the Ford Environmental Management System at all manufacturing facilities worldwide and acquiring certification to the ISO 14001 standard,
2. striving to eliminate the use and release of chlorinated solvents,
3. increased DFE training for product and manufacturing process engineers,
4. continued research on low emissions painting processes,
5. continued efforts to increase the recyclability of Ford products and support an infrastructure that encourages increased use of post-consumer recycled materials in vehicles,
6. continued energy conservation efforts, and
7. continued encouragement of suppliers to utilize environmental management systems and to introduce cost effective product and process improvements that provide environmental improvement.

VII. GENERAL MOTORS CORPORATION

PROJECT STATUS

General Motors' participation in the US Auto Project has benefited both the company and the environment. Over the years, the objectives of the Project have been integrated into our internal initiatives to conserve resources and prevent pollution. The reduction of GLPTs and other materials of concern are part of our overall business practices. GM continues to assess our environmental performance, refine our initiatives accordingly, and report on progress towards our goal of becoming an industry leader in the environmental and health and safety areas.

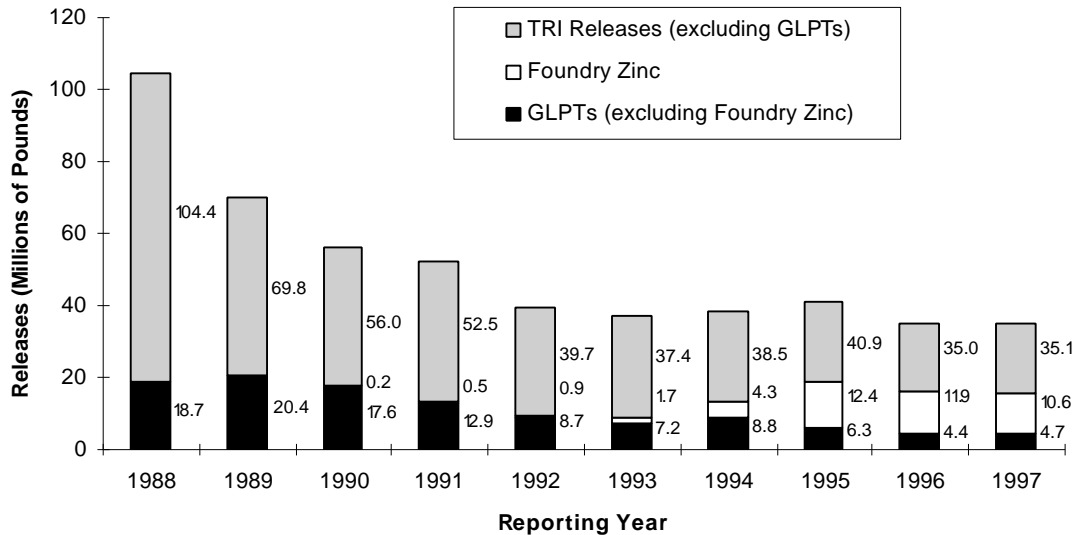
To support our participation in this Project, GM promotes resource conservation and pollution prevention during product and process development cycles and in our manufacturing operations. GLPT reductions remain a priority within the new corporate metric of "non-product output" (see *Measuring Progress* in this section.) Between 1995 and 1997 (since the previous Progress Report III), GM's reportable TRI releases of GLPTs declined by 17 percent (Table 6.)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
No. of Vehicles Produced in US	5,073,429	4,707,187	4,123,540	3,580,267	3,750,334	4,076,451	4,446,225	4,277,269	4,017,128	4,273,557
GLPTs Released (lbs)	18,734,596	20,417,741	17,858,227	13,398,173	9,650,761	8,877,715	13,076,836	18,643,414	16,340,803	15,325,200
Total TRI Released (lbs)	104,412,788	69,819,792	55,982,272	52,464,202	39,700,844	37,374,190	38,481,459	40,883,110	34,955,040	35,108,027
GLPTs (lbs) per Vehicle Produced	3.69	4.34	4.33	3.74	2.57	2.18	2.94	4.36	4.07	3.59
TRI (lbs) per Vehicle Produced	20.58	14.83	13.58	14.65	10.59	9.17	8.65	9.56	8.70	8.22

* GM operations include a larger number of powertrain and component plants which results in higher "per vehicle produced" calculations (see the GM plants list in Appendix E).

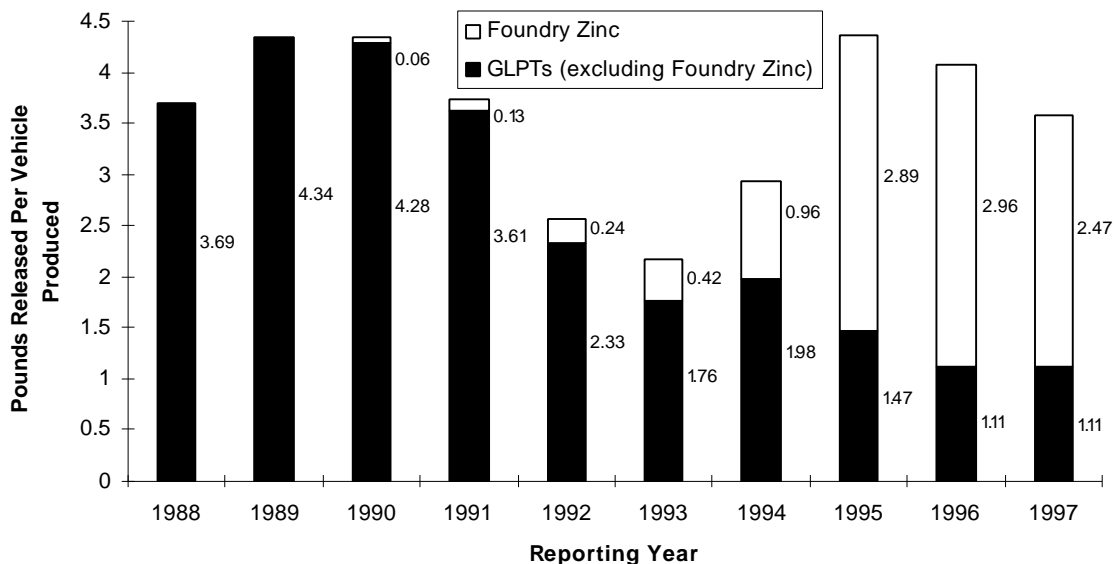
Since the beginning of the Auto Project in 1991, GM's GLPT releases have increased 12.6 percent. This is primarily due to zinc releases from one of our foundries processing recycled scrap from galvanized steel (a corrosion preventative material used in vehicle bodies.) The reported zinc is in the form of a zinc-containing sludge which is controlled in on-site landfills. A corporate plan to divert the galvanized steel scrap from our foundries will eliminate these land releases by 2002. The galvanized steel will be sent to steel processing facilities that can recover the zinc for reuse and the foundry will replace the galvanized steel with non-galvanized steel for their feedstock. Excluding the foundry zinc, TRI releases of all other GLPT substances have been reduced by 63 percent since 1991 (Figure 10) and 69 percent on a production-adjusted basis (Figure 11.)

Figure 10. GLPT Substances Included in Total TRI Reportable Releases (General Motors Corporation US Facilities)



GM's on-site releases (air, water, and land disposal) and off-site transfers of TRI chemicals (to disposal facilities) were 104.4 million pounds in 1988 and 35.1 million pounds in 1997 (as indicated by the combined releases in Figure 10.) This represents a production-adjusted decrease of 60 percent since 1988, or an equivalent reduction of 12.4 pounds of TRI chemicals for every GM vehicle produced in the US

Figure 11. Production Normalized GLPT Reportable Releases (General Motors Corporation US Facilities)



Some of the methods used to achieve these reductions are documented in case studies that are available through the MDEQ's website. The case studies are also distributed internally to our facilities worldwide in a quarterly publication entitled "Knowledge Transfer."

Binational Toxics Strategy (BNS) Substances

GM either does not use or uses minimal amounts of BNS substances in volumes that fall below the reportable levels for TRI substances. Mercury and PCBs (Level I substances) and cadmium (Level II) are the substances of concern at GM. Reduction projects and activities are underway for these substances. The following are a few examples of those efforts.

Use of mercury in vehicles occurs almost entirely in operating switches. The various applications include: selected underhood or trunk lighting systems (tilt switches), some 4-wheel drive antilock braking systems (deceleration detection), and some active ride control systems (adjusts suspension during cornering.) GM is phasing out these mercury switches wherever feasible. Currently, there are no non-mercury replacement sensors known to be in production for anti-lock braking or active ride control systems. As noted in our case study "Elimination of Mercury Switches in Underhood and Trunk Lamps," mercury switches were eliminated in all 1998 Cadillac and Buick models. This amounts to the elimination of 500,000 switches and 1,500 pounds of mercury per year. Mercury is also a source of lighting (mercury vapor) in the new High Intensity Discharge (HID) headlamps which use roughly 0.5 to 1.0 mg per headlamp -- about the size of a grain of salt. HID lamps are a recent technology development that have the potential to improve fuel economy, durability, and safety. They are currently in use in only a limited number of vehicles.

PCBs are being eliminated from GM facilities through a strategic removal project for transformers. PCB liquids are incinerated and the associated equipment carcasses are smelted to recover their metal. GM's goal is to remove all PCB transformers by the end of the year 2000.

Cadmium has been used in plastic pigments and stabilizers for years. For example, it was considered critical, especially to achieve deep red pigments and to protect instrument panel (IP) vinyl from ultraviolet exposure. GM has designed cadmium pigments out of IP's by re-colorizing all vinyls to be cadmium-free. IP skins are now stabilized with less hazardous pigments. Additional cadmium reductions are ongoing throughout GM using the engineering specification "GM 1000M: Restricted and Reportable Chemicals."

ACTIVITIES AND ACCOMPLISHMENTS

Ongoing Activities

A detailed discussion of GM's environmental activities and accomplishments can be found in our comprehensive Environmental, Health & Safety Report. The full report will be available soon on the Internet at www.gm.com/ehsreport. A highlight of GM's resource conservation and pollution prevention activities that support the Auto Project are presented in this section.

GM recognizes that all industries, including the global automotive industry, must determine how to operate in ways that promote economic growth and comprehend the needs of the environment and society, without compromising those needs in the future. We are committed to making progress in these areas and accept that we have a responsibility to share our learning.

"We are all responsible for this planet, but business must take the lead, because only business has the global reach, the innovative capability, the capital, and most importantly, the market motivation to develop the technologies that will allow the world to truly achieve sustainable development."

Harry Pearce, Vice Chairman

Measuring Progress. GM has set aggressive goals for resource conservation and pollution prevention. These goals include:

- 30 percent reduction of non-recycled, non-product output (NPO) by year-end 2002 (baseline year 1997)
- 30 percent reduction of total NPO by incorporation of this goal into each new product program through the next complete cycle of product programs. Reductions will be realized over time in conjunction with the cadence of product roll out plans (baseline year 1997)
- 20 percent reduction in energy use and 20 percent reduction in water use by year-end 2002 (baseline year 1995)

NPO is defined as all material waste streams generated as a result of our operations that are not incorporated into the finished product. The definition is broad in order to provide a performance measure encompassing all potential areas for environmental improvement. This allows us to focus on our business management practices. It is a metric that is not driven by current country-specific regulations and is therefore applicable globally. More information is available on our website about the NPO metric.

Use of Natural Resources. Reducing raw material burden has both environmental and economic benefits. To realize these benefits, we plan to achieve NPO reduction goals through the practices of both source reduction and internal reuse and recycling of waste materials. Where source reduction or internal reuse is not feasible, then recycling markets that maximize the value of the waste materials will be pursued.

GM already has many significant projects and programs underway that address NPO reductions. Here are highlights of just a few:

A Priority Processes Identification process supplements GM's NPO reduction targets by including the objective of further reducing risk to human health and the environment. Through a combination of screening procedures employed during the evaluation of new products,

materials, and manufacturing processes, NPO reduction activities are prioritized to achieve the most significant improvements in areas that create the greatest possible environmental benefits. The evaluation of existing operations and emissions is also considered in the process.

The inclusion of Environmental Metrics into the Vehicle Line Executive (VLE) charter template process. These metrics track product programs for performance to specific targets for vehicle recyclability, vehicle emissions, and fuel economy goals. These may also be expanded to include NPO targets. Vehicle programs set targets for vehicle environmental metrics based on market demands and anticipated regulatory requirements for their product segment.

Chemicals Management is a global initiative to improve process efficiency and is accomplished through contracting with a supplier to provide production chemicals and associated services on a fixed fee basis. The supplier then has the financial incentive to help GM improve its operating efficiency and reduce its use of chemicals while improving quality. GM was the first automotive company to develop and implement a chemicals management program. The teamwork experienced between GM and its suppliers through these contracts is being emulated by other companies in a variety of different business sectors.

Resource Management is a program similar in concept to chemicals management in which a single supplier is hired at a GM facility as a resource manager. The supplier's responsibility is to manage all plant waste streams in such a manner that disposal and landfill become the least desirable options. At one Michigan assembly plant, for instance, the resource manager increased the plant's waste recycling rate from 19 percent to more than 50 percent in just six months. This program is being applied globally within the Corporation.

Energy Management at GM focuses on efficiency as a key element. The GM Energy Efficiency Initiative is now in its third year of implementation and has saved 1.17 billion kWh of electricity and 1.7 trillion Btu of fuel to date. For example, landfill gas was added as a fuel source at the Toledo transmission plant as a result of boiler modifications in 1997. Approximately 40,000 MMBtu of traditional boiler fuel usage has been replaced with the landfill gas.

The Conserve Resources/ Prevent Pollution (WE CARE) Action Strategy of GM's total quality process provides training materials and guidance to our operations in reducing the impact of our operations and products on the environment. A training module for "Manufacturing & Assembly" operations, which targets the largest audience within GM, was distributed internally in early 1998. Modules are nearing release for the "Design & Engineering" and "Office Environment" employees.

Design for the Environment. GM's Design and Manufacture for the Environment Committee (DME) coordinates the incorporation of life-cycle thinking into the design and manufacture of GM vehicles. The committee has worldwide participants from the North American car and truck platforms, Delphi, Isuzu, Opel, Saab, Vauxhall, and the corporate staffs such as Research & Development, Environmental Services, and the Public Policy Center.

Awareness and training programs for design engineers have begun to show results. GM's vehicle development process incorporates recyclability goals and design-for-the-environment check points that have resulted in:

- Improved material and energy utilization
- Lower energy consumption and waste volumes
- Plastics specifically designed and coded for recycling
- Use of recycled plastics and other materials whenever possible in new vehicle production
- Selection of materials that make dismantling and recycling easier (using the GM Recycling Design Guide: GM 502M)

We also have ongoing programs to commonize material specifications to reduce waste and to globally commonize the list of restricted and reportable materials that are associated with potential health and environmental concerns.

Supplier Relationships. "It is our policy to encourage and promote responsible environmental management in the design, production, and delivery of purchased goods and services." In March 1998, GM's Worldwide Purchasing Manual incorporated the previous text plus the following language. "We expect every supplier to:

- Develop and communicate to its employees and suppliers an environmental policy statement that reflects commitment to comply with all legal requirements and to conduct its operations and activities in ways that protect human health and the environment, and
- Adopt resource conservation and pollution prevention goals to support continuous improvement."

We are also pursuing ways to strengthen our environmental approach to the supply chain. In 1997, we formed the GM Supplier Environmental Advisory Team (SEA Team). The team is comprised of both supplier members of GM's Supplier Council and GM representatives. In meetings to date, the team has established three basic building blocks to achieve its objectives of improving the effectiveness of existing GM initiatives and exploring new ideas that mutually promote eco-efficiency. The building blocks are: environmental management system implementation, design for the environment, and environmental metrics. Using these building blocks, the team is focusing its efforts on the development of sustainability in the supply chain.

GM continues to actively share its knowledge of environmentally preferable processes with suppliers through the PICOSTM Initiative on Resource Conservation and Pollution Prevention. Through on-site workshops at supplier locations, GM supplier development engineers work with suppliers' employees to eliminate waste from their processes.

Accomplishments

In recognition of our continuous improvement in the area of pollution prevention, GM people and facilities have recently received numerous public awards worldwide. Here are just a few examples from the US:

- In June 1998, the Keystone Center, a non-profit public-policy and education organization, awarded GM its annual "Leadership in Industry" award for environmental performance. GM



was the first and only automotive company to be recognized for environmental performance by the Keystone Center.

- Delphi Delco Electronics (formerly Delco Electronics Corporation) was presented the Indiana Governor's "Award for Excellence in Pollution Prevention." This award was the result of successfully changing their flux process that prepares circuit boards for soldering.
- The Oklahoma City, Oklahoma, Assembly Plant was honored by the University of Oklahoma Health Sciences Center with the "Dan J. Macer Environmental Excellence Award" for waste reduction.

FUTURE DIRECTION

GM and its people understand the need to balance economic, environmental, and social issues. The Auto Project has had a positive affect on both our internal practices and the working relationships we have developed with external stakeholders. We understand that, as a global leader, we must hold ourselves to the highest principles of responsibility for our environmental and health and safety activities, and that the world will judge us by our actions. Our beliefs, as well as our participation in voluntary initiatives like the Auto Project, have led us to evolve sustainable development initiatives that hold great potential for benefiting both GM and the world in which we work.

The GM Environmental Principles provide the foundation for our commitment to our employees and the communities where we operate. We believe we are on the right road. While our progress has been significant, we recognize that even greater challenges and opportunities are ahead. We will achieve our vision of becoming an industry leader in environmental and health and safety areas through deeds, not words.

LIST OF APPENDICES:

APPENDIX A:	List of Great Lakes Persistent Toxic (GLPT) Substances
APPENDIX B:	List of Binational Toxics Strategy (BNS) Substances
APPENDIX C:	Chrysler Plant List and Data
APPENDIX D:	Ford Plant List and Data
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APPENDIX F:	Combined AAMA Member Company Data <ul style="list-style-type: none">• 1995 - 1997 GLPT Releases and Transfers• 1997 GLPT Releases and Transfers by Plant Type
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Appendix A: Great Lakes Persistent Toxic Substances (GLPTs)

THE AUTOMOBILE INDUSTRY AND MICHIGAN DEPARTMENT OF NATURAL RESOURCES AGREEMENT ON A POLLUTION PREVENTION ACTION PLAN FOR THE GREAT LAKES

In December 1991, the Michigan Department of Natural Resources (MDNR) and the Motor Vehicle Manufacturers Association of the US Inc. (MVMA) on behalf of Chrysler Corporation, Ford Motor Company and General Motors Corporation (auto companies) agreed to the criteria and list of persistent toxics to be targeted under the Agreement. Persistent toxics are defined as any toxic substance that has accumulated to levels which significantly impact the Great Lakes System, as evidenced by direct measurement. Significant impact is further defined as an adverse impact to human health, aquatic life or wildlife, e.g., reduced reproductive viability, restriction of fish consumption, disease, and death. The chemicals presented represent materials with repeated evidence of contamination of water, biota and/ or sediments of the Great Lakes system that are also known to be persistent, bioaccumulative and/or toxic to aquatic or terrestrial life. The list will remain in effect for four years to allow for the adequate planning and implementation of pollution prevention strategies.

HALOGENATED HYDROCARBONS		METALS
Dichlorobenzenes	Octachlorostyrene	Antimony
Ethylene Dibromide	Pentachlorobenzene	Arsenic
Hexachlorobenzene	Polychlorinated Biphenyls (PCBS)	Beryllium
Hexachlorobutadiene	Tetrachlorobenzene	Cadmium
Hexachloroethane	Tetrachlorodibenzodioxin (TCDD)	Chromium
Methyl Chloride	Tetrachlorodibenzofuran (TCDF)	Copper
Methylene Chloride	Tetrachloroethylene	Lead
Nonachlor	Trichloroethylene	Mercury
	Trichlorophenols	Nickel
		Selenium
		Silver
		Zinc
NON-HALOGENATED HYDROCARBONS		PESTICIDES
Benzene	Polynuclear Aromatic	Aldrin
2, 4-Dinitrotoluene	Hydrocarbons (PAHs):	Chlordane
Ethylbenzene	acenaphthalene	DDD
Isophorone	acenaphthene	DDE
Nitrobenzene	anthracene	DDT
Phenol	benzo (a) anthracene	Dieldrin
Phthalates:	benzo (a) pyrene	Heptachlor
*butylbenzyl phthalate	benzo (k) fluoranthene	Lindane
diethyl hexyl phthalate, (DEHP)	chrysene	Mirex
*diethyl phthalate	fluorene	Oxychlordane
dimethyl phthalatedi-n-butyl	indeno (1,2,3) pyrene	Toxaphene
phthalate	naphthalene	
	phenanthrene	
	pyrene	
	Terphenyl	
	Toluene	

* these two substances have been removed from the list of GLPTs since the inception of the Project.

Appendix B: Great Lakes Binational Toxics Strategy (BNS) Substances

The Great Lakes Binational Toxics Strategy is an agreement signed in 1997 by the US EPA and Environment Canada to take specific steps towards the virtual elimination of 16 named chemicals, designated Level I substances, from Great Lakes discharges. It also seeks to reduce inputs of 21 additional, Level II substances through pollution prevention efforts. Importantly, the program is voluntary in nature.

Level I Substances	Level II Substances
Aldrin/dieldrin Benzo (a) pyrene Chlordane DDT (and DDD, DDE) Hexachlorobenzene Alkyl-lead Mercury and mercury compounds Mirex Octachlorostyrene PCBs PCDD (dioxins) and PCDF (furans) Toxaphene	Cadmium and cadmium compounds 1,4 dichlorobenzene 3,3' dichlorobenzidine Dinitropyrene Endrin Heptachlor and heptachlor epoxide Hexachlorobutadiene and hexachloro-1,3 butadiene Hexachlorocyclohexane 4,4' methylenebis (2-chloroaniline) Pentachlorobenzene Pentachlorophenol Tetrachlorobenzene (1,2,3,4 and 1,2,4,5) Tributyl tin Anthracene Benzo(a)anthracene Benzo(g,h,i)perylene Perylene Phenanthrene

Appendix C: Chrysler Plant List and Data

1997 US EPA TOXIC RELEASE INVENTORY DATA FROM THE FOLLOWING CHRYSLER CORPORATION PLANTS WAS USED TO CALCULATE THE 1997 US AUTO PROJECT REPORT DATA

ASSEMBLY AND STAMPING PLANTS

Belvidere Assembly (Illinois)
Toledo Jeep Parkway (Ohio)
Toledo Jeep Stickney (Ohio)
Jefferson Assembly North (Michigan)
Newark Assembly (Delaware)
St. Louis II, North (Missouri)
St. Louis I, South (Missouri)
Sterling Heights Assembly (Michigan)
Warren Truck (Michigan)
Twinsburg Stamping (Michigan)
Conner Avenue Assembly (Michigan)

OTHER

Chrysler Pacifica (California)
Jeep Truck Engineering (Michigan)
Mt. Elliot Drive Manufacturing Technical
Center (Michigan)
Chrysler Technology Center (Michigan)

POWERTRAIN OPERATIONS

Indianapolis Foundry (Indiana)
Kenosha Engine (Wisconsin)
Kokomo Casting (Indiana)
Kokomo Transmission (Indiana)
Mound Road Engine (Michigan)
Trenton Engine (Michigan)

PARTS PLANTS

Dayton Thermal Products (Ohio)
Detroit Axle (Michigan)
Huntsville Electronics (Alabama)
Huntsville Electronics Plant II (Alabama)
McGraw Glass (Michigan)
New Castle Chassis Systems (Indiana)
Toledo Machining (Ohio)

Appendix C: Great Lakes Persistent Toxic Substances Reported Released/Transferred (in Pounds) in 1997 by Chrysler Corporation

	(per USEPA TRI Report)							
CHRYSLER CORPORATION								
	ASSEMBLY				PARTS			
	Release	Energy Rec.	Recycling	Treatment	Release	Energy Rec.	Recycling	Treatment
HEAVY METAL SUBSTANCES								
Antimony and Compounds	0	0	0	0	93	0	5,700	0
Arsenic and Compounds	0	0	0	0	0	0	0	0
Cadmium and Compounds	0	0	0	0	0	0	0	0
Chromium and Compounds	0	0	0	0	6,330	0	660	110
Copper and Compounds	7,800	0	0	0	5,950	0	9,200	0
Lead and Compounds	3,820	0	0	0	2,025	0	30,000	28
Nickel and Compounds	25,700	0	1,400	0	7,600	0	0	90
Silver and Compounds	0	0	0	0	38	0	3,800	0
Zinc and Compounds	83,510	0	2,300	23	88	0	0	880
HALOGENATED SUBSTANCES								
1,2-Dibromoethane	0	0	0	0	0	0	0	0
Dichloromethane	0	0	0	0	0	0	0	0
Tetrachloroethylene	0	0	0	0	0	0	0	0
Trichloroethylene	0	0	0	0	0	0	0	0
NON-HALOGENATED SUBSTANCES								
Benzene	265	77	660	680	0	0	0	0
Butyl benzyl phthalate	0	0	0	0	0	0	0	0
Di-(2-ethylhexyl) phthalate	0	0	0	0	0	0	0	0
Dibutylphthalate	0	0	0	0	0	0	0	0
Diethyl phthalate	0	0	0	0	0	0	0	0
Ethylbenzene	196,457	6,533	313,530	17,684	0	0	0	0
Naphthalene	0	0	0	0	0	0	0	0
Phenol	0	0	0	0	0	0	0	0
Polychlorinated biphenyls (PCB's)	0	0	0	0	0	0	0	0
Toluene	82,330	4,393	2,618	7,682	0	0	0	0
Total GLPT Substances	399,882	11,003	320,508	26,069	22,124	0	49,360	1,108
Total TRI Substances	3,428,268	306,184	2,681,417	1,201,684	99,775	0	146,360	298,215

Appendix C: Great Lakes Persistent Toxic Substances Reported Released/Transferred (in Pounds) in 1997 by Chrysler Corporation

	(per USEPA TRI Report)							
CHRYSLER CORPORATION								
	POWERTRAIN				STAMPING			
	Release	Energy Rec.	Recycling	Treatment	Release	Energy Rec.	Recycling	Treatment
HEAVY METAL SUBSTANCES								
Antimony and Compounds	0	0	0	0	0	0	0	0
Arsenic and Compounds	0	0	0	0	0	0	0	0
Cadmium and Compounds	0	0	0	0	0	0	0	0
Chromium and Compounds	23,006	0	0	0	0	0	0	0
Copper and Compounds	48,122	0	307,940	4,500	0	0	0	0
Lead and Compounds	0	0	0	0	0	0	0	0
Nickel and Compounds	9,046	0	23,600	150	0	0	0	0
Silver and Compounds	0	0	0	0	0	0	0	0
Zinc and Compounds	390,000	0	23	23	2	0	0	0
HALOGENATED SUBSTANCES								
1,2-Dibromoethane	0	0	0	0	0	0	0	0
Dichloromethane	0	0	0	0	0	0	0	0
Tetrachloroethylene	0	0	0	0	0	0	0	0
Trichloroethylene	0	0	0	0	0	0	0	0
NON-HALOGENATED SUBSTANCES								
Benzene	0	0	0	0	0	0	0	0
Butyl benzyl phthalate	0	0	0	0	0	0	0	0
Di-(2-ethylhexyl) phthalate	0	0	0	0	0	0	0	0
Dibutylphthalate	0	0	0	0	0	0	0	0
Diethyl phthalate	0	0	0	0	0	0	0	0
Ethylbenzene	0	0	0	0	24	0	0	0
Naphthalene	0	0	0	0	0	0	0	0
Phenol	4,500	0	0	1,420	0	0	0	0
Polychlorinated biphenyls (PCB's)	0	0	0	0	0	0	0	0
Toluene	0	0	0	0	0	0	0	0
Total GLPT Substances	474,674	0	331,563	6,093	26	0	0	0
Total TRI Substances	804,221	0	371,832	440,056	457	0	0	0

Appendix C: Great Lakes Persistent Toxic Substances Reported Released/Transferred (in Pounds) in 1997 by Chrysler Corporation

	(per USEPA TRI Report)							
CHRYSLER CORPORATION								
	OTHER				TOTAL			
	Release	Energy Rec.	Recycling	Treatment	Release	Energy Rec.	Recycling	Treatment
HEAVY METAL SUBSTANCES								
Antimony and Compounds	0	0	0	0	93	0	5,700	0
Arsenic and Compounds	0	0	0	0	0	0	0	0
Cadmium and Compounds	0	0	0	0	0	0	0	0
Chromium and Compounds	2,051	0	59,662	21	31,387	0	60,322	131
Copper and Compounds	15,578	0	48,000	520	77,450	0	365,140	5,020
Lead and Compounds	0	0	0	0	5,845	0	30,000	28
Nickel and Compounds	13,158	0	112,342	13	55,504	0	137,342	253
Silver and Compounds	0	0	0	0	38	0	3,800	0
Zinc and Compounds	0	0	0	0	473,600	0	2,323	926
HALOGENATED SUBSTANCES								
1,2-Dibromoethane	0	0	0	0	0	0	0	0
Dichloromethane	0	0	0	0	0	0	0	0
Tetrachloroethylene	0	0	0	0	0	0	0	0
Trichloroethylene	0	0	0	0	0	0	0	0
NON-HALOGENATED SUBSTANCES								
Benzene	0	0	0	0	265	77	660	680
Butyl benzyl phthalate	0	0	0	0	0	0	0	0
Di-(2-ethylhexyl) phthalate	0	0	0	0	0	0	0	0
Dibutylphthalate	0	0	0	0	0	0	0	0
Diethyl phthalate	0	0	0	0	0	0	0	0
Ethylbenzene	0	0	0	0	196,481	6,533	313,530	17,684
Naphthalene	0	0	0	0	0	0	0	0
Phenol	0	0	0	0	4,500	0	0	1,420
Polychlorinated biphenyls (PCB's)	0	0	0	0	0	0	0	0
Toluene	0	0	0	0	82,330	4,393	2,618	7,682
Total GLPT Substances	30,787	0	220,004	554	927,493	11,003	921,435	33,824
Total TRI Substances	35,785	0	294,000	647	4,368,506	306,184	3,493,609	1,940,602

Appendix D: Ford Plant List and Data

1997 US EPA TOXIC RELEASE INVENTORY DATA FROM THE FOLLOWING FORD MOTOR COMPANY PLANTS WAS USED TO CALCULATE THE 1997 US AUTO PROJECT REPORT DATA

ASSEMBLY PLANTS

Atlanta Assembly Plant (Georgia)
Chicago Assembly Plant (Illinois)
Dearborn Assembly Plant (Michigan)
Edison Assembly Plant (New Jersey)
Kansas City Assembly Plant (Missouri)
Kentucky Truck Assembly Plant
(Kentucky)
Lorain Assembly Plant (Ohio)
Louisville Assembly Plant (Kentucky)
Michigan Truck Assembly Plant
(Michigan)
Norfolk Assembly Plant (Virginia)
Ohio Assembly Plant (Ohio)
St. Louis Assembly Plant (Missouri)
Twin Cities Assembly Plant (Minnesota)
Wayne Assembly Plant (Michigan)
Wixom Assembly Plant (Michigan)

STAMPING PLANTS

Chicago Stamping Plant (Illinois)
Dearborn Frame Plant (Michigan)
Dearborn Stamping Plant (Michigan)
Dearborn Tool & Die Plant (Michigan)
Monroe Stamping Plant (Michigan)
Walton Hills Stamping Plant (Ohio)
Wayne Integral Stamping Plant (Michigan)
Woodhaven Stamping Plant (Michigan)

Other

Rouge Power & Utilities Operations
(Michigan)

POWERTRAIN OPERATIONS

Batavia Transaxle Plant (Ohio)
Cleveland Casting Plant (Ohio)
Cleveland Engine 1&2 (Ohio)
Dearborn Engine Plant (Michigan)
Lima Engine Plant (Ohio)
Livonia Transmission Plant (Michigan)
Romeo Engine Plant (Michigan)
Sharonville Transmission Plant (Ohio)
Sterling Axle Plant (Michigan)
Van Dyke Axle Plant (Michigan)
Vulcan Forge Plant (Michigan)
Woodhaven Forge Plant (Michigan)

PARTS PLANTS

Chesterfield Trim Plant (Michigan)
Connersville Plant (Indiana)
Dearborn Glass Plant (Michigan)
Indianapolis Chassis Plant (Indiana)
Milan Plastics Plant (Michigan)
Nashville Glass Plant (Tennessee)
North Penn Plant (Pennsylvania)
Rawsonville Plant (Michigan)
Saline Plastics Plant (Michigan)
Sandusky Plastics Plant (Ohio)
Sheldon Road Plant (Michigan)
Tulsa Glass Plant (Oklahoma)
Utica Trim Plant (Michigan)
Ypsilanti Plant (Michigan)

Appendix D: Great Lakes Persistent Toxic Substances Reported Released/Transferred (in Pounds) in 1997 by Ford Motor Company								
	(per USEPA TRI Report)							
FORD MOTOR COMPANY								
	ASSEMBLY				PARTS			
	Release	Energy Rec.	Recycling	Treatment	Release	Energy Rec.	Recycling	Treatment
HEAVY METAL SUBSTANCES								
Antimony and Compounds	609	0	0	0	0	0	0	0
Arsenic and Compounds	0	0	0	0	0	0	0	0
Cadmium and Compounds	0	0	0	0	0	0	0	0
Chromium and Compounds	4,868	0	0	0	2,572	0	839	1,910
Copper and Compounds	61	0	0	0	11,651	0	1,114,281	292
Lead and Compounds	17,423	0	22	2,857	49	0	9,403	8,220
Nickel and Compounds	23,331	0	10	0	2,845	0	13,000	0
Silver and Compounds	0	0	0	0	0	0	0	0
Zinc and Compounds	167,086	65	4,142	5,449	21,800	500	842	0
HALOGENATED SUBSTANCES								
1,2-Dibromoethane	0	0	0	0	0	0	0	0
Dichloromethane	12,600	0	0	0	29,060	0	90,000	200
Tetrachloroethylene	0	0	0	0	0	0	0	0
Trichloroethylene	0	0	0	0	478,000	89,000	0	140
NON-HALOGENATED SUBSTANCES								
Benzene	2,590	93	0	693	0	0	0	0
Butyl benzyl phthalate	0	0	0	0	0	0	0	0
Di-(2-ethylhexyl) phthalate	2,499	0	3	2,240	0	0	0	0
Dibutylphthalate	0	0	0	0	0	0	0	0
Diethyl phthalate	0	0	0	0	0	0	0	0
Ethylbenzene	1,312,560	100,327	1,248,652	636,892	87,560	2,290	26,900	45,735
Naphthalene	0	0	0	0	0	0	0	0
Phenol	0	0	0	0	0	0	0	0
Polychlorinated biphenyls (PCBs)	0	0	0	0	0	0	0	0
Toluene	254,479	38,251	336,739	76,426	59,117	4,795	33,130	52,200
Total GLPT Substances	1,798,106	138,736	1,589,568	724,557	692,654	96,585	1,288,395	108,697
Total TRI Substances	14,721,674	1,738,234	12,091,035	10,694,693	1,871,510	139,115	1,840,425	966,881

Appendix D: Great Lakes Persistent Toxic Substances Reported Released/Transferred (in Pounds) in 1997 by Ford Motor Company

	(per USEPA TRI Report)							
FORD MOTOR COMPANY								
	POWERTRAIN				STAMPING			
	Release	Energy Rec.	Recycling	Treatment	Release	Energy Rec.	Recycling	Treatment
HEAVY METAL SUBSTANCES								
Antimony and Compounds	0	0	0	0	0	0	0	0
Arsenic and Compounds	0	0	0	0	0	0	0	0
Cadmium and Compounds	0	0	0	0	0	0	0	0
Chromium and Compounds	63,215	0	251,460	0	2,483	0	5	0
Copper and Compounds	99,243	0	1,290,100	450	384	0	270	0
Lead and Compounds	1,443	0	880	0	110	0	0	0
Nickel and Compounds	24,435	0	252,890	160	2,129	0	4,241	0
Silver and Compounds	0	0	0	0	0	0	0	0
Zinc and Compounds	848,042	0	51,000	0	739	0	202	0
HALOGENATED SUBSTANCES								
1,2-Dibromoethane	0	0	0	0	0	0	0	0
Dichloromethane	0	0	0	0	0	0	0	0
Tetrachloroethylene	0	0	0	0	0	0	0	0
Trichloroethylene	0	0	0	0	0	0	0	0
NON-HALOGENATED SUBSTANCES								
Benzene	46,000	0	0	0	0	0	0	0
Butyl benzyl phthalate	0	0	0	0	0	0	0	0
Di-(2-ethylhexyl) phthalate	0	0	0	0	0	0	0	0
Dibutylphthalate	0	0	0	0	0	0	0	0
Diethyl phthalate	0	0	0	0	0	0	0	0
Ethylbenzene	0	0	0	0	0	0	0	0
Naphthalene	57,000	0	27	0	0	0	0	0
Phenol	33,213	0	0	1,900	0	0	0	0
Polychlorinated biphenyls (PCB's)	0	0	0	0	0	0	0	0
Toluene	37,344	6	0	0	138	0	0	0
Total GLPT Substances	1,209,935	6	1,846,357	2,510	5,983	0	4,718	0
Total TRI Substances	2,479,411	56	4,095,843	873,889	59,979	0	8,563	186,422

Appendix D: Great Lakes Persistent Toxic Substances Reported Released/Transferred (in Pounds) in 1997 by Ford Motor Company								
	(per USEPA TRI Report)							
FORD MOTOR COMPANY								
	OTHER				TOTAL			
	Release	Energy Rec.	Recycling	Treatment	Release	Energy Rec.	Recycling	Treatment
HEAVY METAL SUBSTANCES								
Antimony and Compounds	0	0	0	0	609	0	0	0
Arsenic and Compounds	0	0	0	0	0	0	0	0
Cadmium and Compounds	0	0	0	0	0	0	0	0
Chromium and Compounds	0	0	0	0	73,138	0	252,304	1,910
Copper and Compounds	11	0	0	0	111,350	0	2,404,651	742
Lead and Compounds	0	0	0	0	19,025	0	10,305	11,077
Nickel and Compounds	0	0	0	0	52,740	0	270,141	160
Silver and Compounds	0	0	0	0	0	0	0	0
Zinc and Compounds	1	0	6	0	1,037,668	565	56,192	5,449
HALOGENATED SUBSTANCES								
1,2-Dibromoethane	0	0	0	0	0	0	0	0
Dichloromethane	0	0	0	0	41,660	0	90,000	200
Tetrachloroethylene	0	0	0	0	0	0	0	0
Trichloroethylene	0	0	0	0	478,000	89,000	0	140
NON-HALOGENATED SUBSTANCES								
Benzene	0	0	0	0	48,590	93	0	693
Butyl benzyl phthalate	0	0	0	0	0	0	0	0
Di-(2-ethylhexyl) phthalate	0	0	0	0	2,499	0	3	2,240
Dibutylphthalate	0	0	0	0	0	0	0	0
Diethyl phthalate	0	0	0	0	0	0	0	0
Ethylbenzene	0	0	0	0	1,400,120	102,617	1,275,552	682,627
Naphthalene	0	0	0	0	57,000	0	27	0
Phenol	0	0	0	0	33,213	0	0	1,900
Polychlorinated biphenyls (PCBs)	0	0	0	0	0	0	0	0
Toluene	2	0	0	0	351,080	43,052	369,869	128,626
Total GLPT Substances	14	0	6	0	3,706,692	235,327	4,729,044	835,764
Total TRI Substances	550,099	0	6	0	19,682,673	1,877,405	18,035,872	12,721,885

Appendix E: General Motors Plant List and Data

1997 US EPA TOXIC RELEASE INVENTORY DATA FROM THE FOLLOWING GENERAL MOTORS CORPORATION PLANTS WAS USED TO CALCULATE THE 1997 US AUTO PROJECT REPORT DATA

ASSEMBLY PLANTS

Arlington Truck Assembly (Texas)
Baltimore Truck Assembly (Maryland)
Bowling Green Car Assembly (Kentucky)
Detroit Truck Assembly (Michigan)
Detroit/Hamtramck Assembly (Michigan)
Doraville Car Assembly (Georgia)
Fairfax Car Assembly (Kansas)
Flint Truck Assembly (Michigan)
Flint-Buick City Assembly (Michigan)
Fort Wayne Truck Assembly (Indiana)
Janesville Truck Assembly (Wisconsin)
Lansing Car Assembly Plt. 1 (Michigan)
Lansing Body & Assembly Plt. 2/3/6
(Michigan)
Linden Truck Assembly (New Jersey)
Lordstown Car Assembly (Ohio)
Moraine Truck Assembly (Ohio)
Oklahoma City Car Assembly (Oklahoma)
Orion Car Assembly (Michigan)
Pontiac East Truck Assembly (Michigan)
Saturn Car Assembly (Tennessee)
Shreveport Truck Assembly (Louisiana)
Wentzville Truck Assembly (Missouri)
Wilmington Car Assembly (Delaware)

STAMPING PLANTS

Flint Metal Fab (Michigan)
Grand Blanc Metal Fab (Michigan)
Kalamazoo Metal Fab (Michigan)
Lansing Metal Fab Plt. 3 (Michigan)
Lordstown Metal Fab (Ohio)
Pontiac Metal Fab (Michigan)

POWERTRAIN OPERATIONS

Allison Transmission Plt. 3/12/14 (Indiana)
Bay City Transmission (Michigan)
Bedford Foundry (Indiana)
Defiance Foundry (Ohio)
Flint Components (Michigan)
Flint Machine Tool (Michigan)
Flint V-6 Engine (Michigan)
Flint V-6 Engineering (Michigan)
Flint V-8 Engine (Michigan)
Lansing Delta Engine (Michigan)
Lansing Engine Plt. 1 (Michigan)
Livonia Engine (Michigan)
Massena Foundry (New York)
Moraine Engine (Ohio)
Romulus Engine (Michigan)

Romulus Transmission (Michigan)
Saginaw Malleable Iron (Michigan)
Saginaw Metal Casting Operations (Michigan)
Toledo Transmission (Ohio)
Tonawanda Engine (New York)
Warren Transmission (Michigan)
Ypsilanti Transmission (Michigan)

PARTS PLANTS

Delco Electronics, Kokomo (Indiana)
Delco Electronics, Milwaukee (Wisconsin)
Delphi-Chassis, Dayton Home Ave.(Ohio)
Delphi-Chassis, Dayton Needmore Rd.(Ohio)
Delphi-Chassis, Dayton Wisconsin Blvd.(Ohio)
Delphi-Chassis, Flint (Michigan)
Delphi-Chassis, Kettering (Ohio)
Delphi-Chassis, Livonia (Michigan)
Delphi-Chassis, Sandusky (Ohio)
Delphi-Chassis, Vandalia (Ohio)
Delphi-E, Albany (Georgia)
Delphi-E, Anaheim (California)
Delphi-E, Anderson (Indiana)
Delphi-E, Coopersville (Michigan)
Delphi-E, Fitzgerald (Georgia)
Delphi-E, Flint East (Michigan)
Delphi-E, Flint West (Michigan)
Delphi-E, Grand Rapids (Michigan)
Delphi-E, Milwaukee (Wisconsin)
Delphi-E, Muncie (Indiana)
Delphi-E, New Brunswick (New Jersey)
Delphi-E, Olathe (Kansas)
Delphi-E, Rochester (New York)
Delphi-Harrison, Lockport (New York)
Delphi-Harrison, Moraine (Ohio)
Delphi-Harrison, Tuscaloosa (Alabama)
Delphi-I, Adrian (Michigan)
Delphi-I, Anderson (Indiana)
Delphi-I, Columbus (Ohio)
Delphi-I, Grand Rapids (Michigan)
Delphi-I, Monroe (Louisiana)
Delphi-I, Vandalia (Ohio)
Delphi-Packard, Clinton (Mississippi)
Delphi-Packard, Warren Dana St. (Ohio)
Delphi-Packard, Warren River Rd. (Ohio)
Delphi-Saginaw, Athens (Alabama)
Delphi-Saginaw, Saginaw Plt 2 (Michigan)
Delphi-Saginaw, Saginaw Holland Rd.
(Michigan)

OTHER

Electromotive, LaGrange (Illinois)
GM Service Parts Operations, Flint (Michigan)

Appendix E: Great Lakes Persistent Toxic Substances Reported Released/Transferred (in Pounds) in 1997 by General Motors

	(per USEPA TRI Report)							
GENERAL MOTORS								
	ASSEMBLY				PARTS			
	Release	Energy Rec.	Recycling	Treatment	Release	Energy Rec.	Recycling	Treatment
HEAVY METAL SUBSTANCES								
Antimony and Compounds	0	0	0	0	185	0	158,400	0
Arsenic and Compounds	0	0	0	0	0	0	0	0
Cadmium and Compounds	0	0	0	0	0	0	0	0
Chromium and Compounds	4,890	0	0	0	126,938	0	289,575	37,530
Copper and Compounds	84,710	0	51,500	0	138,775	0	13,732,645	0
Lead and Compounds	39,366	0	1,390	400	104,343	86	41,953,372	4,112
Nickel and Compounds	30,448	0	3,543	0	30,478	0	107,218	0
Silver and Compounds	0	0	0	0	0	0	0	0
Zinc and Compounds	139,327	0	7,896	2,200	611,800	380	74,110	1,800
HALOGENATED SUBSTANCES								
1,2-Dibromoethane	0	0	0	0	0	0	0	0
Dichloromethane	0	0	0	0	0	0	0	0
Tetrachloroethylene	0	0	0	0	8,000	6,000	0	0
Trichloroethylene	0	0	0	0	40,580	10,500	45,000	0
NON-HALOGENATED SUBSTANCES								
Benzene	4,087	1,230	3,820	55	0	0	0	0
Butyl benzyl phthalate	0	0	0	0	0	0	0	0
Di-(2-ethylhexyl) phthalate	0	0	0	0	914	1	0	0
Dibutylphthalate	0	0	0	0	0	0	0	0
Diethyl phthalate	0	0	0	0	0	0	0	0
Ethylbenzene	667,935	251,628	715,700	1,023	525	0	0	53
Naphthalene	0	0	0	0	0	0	0	0
Phenol	0	0	0	0	33,020	1,326	0	0
Polychlorinated biphenyls (PCBs)	0	0	0	0	0	0	0	0
Toluene	699,532	307,103	630,070	8,664	97,659	2,525	0	53
Total GLPT Substances	1,670,295	559,961	1,413,919	12,342	1,193,217		56,360,320	43,548
Total TRI Substances	16,550,898	2,747,608	9,380,704	331,834	2,808,571	205,105	56,815,033	194,251

Appendix E: Great Lakes Persistent Toxic Substances Reported Released/Transferred (in Pounds) in 1997 by General Motors								
	(per USEPA TRI Report)							
GENERAL MOTORS								
	POWERTRAIN				STAMPING			
	Release	Energy Rec.	Recycling	Treatment	Release	Energy Rec.	Recycling	Treatment
HEAVY METAL SUBSTANCES								
Antimony and Compounds	0	0	0	0	0	0	0	0
Arsenic and Compounds	0	0	0	0	0	0	0	0
Cadmium and Compounds	0	0	0	0	0	0	0	0
Chromium and Compounds	116,540	0	24,651	18	0	0	0	0
Copper and Compounds	162,262	0	106,350	77	0	0	0	0
Lead and Compounds	484,444	0	4,390	0	0	0	0	0
Nickel and Compounds	34,113	0	11,635	43	0	0	0	0
Silver and Compounds	0	0	0	0	0	0	0	0
Zinc and Compounds	11,221,678	0	82,550	0	11,897	644	10,815	0
HALOGENATED SUBSTANCES								
1,2-Dibromoethane	0	0	0	0	0	0	0	0
Dichloromethane	0	0	0	0	0	0	0	0
Tetrachloroethylene	24,000	0	25,000	0	0	0	0	0
Trichloroethylene	0	0	0	0	0	0	0	0
NON-HALOGENATED SUBSTANCES								
Benzene	167,391	230	0	0	0	0	0	0
Butyl benzyl phthalate	0	0	0	0	0	0	0	0
Di-(2-ethylhexyl) phthalate	0	0	0	0	0	0	0	0
Dibutylphthalate	0	0	0	0	0	0	0	0
Diethyl phthalate	0	0	0	0	0	0	0	0
Ethylbenzene	252	2	0	0	9	0	0	0
Naphthalene	83,145	0	114	401	0	0	0	0
Phenol	109,806	0	650	2,600	0	0	0	0
Polychlorinated biphenyls (PCBs)	0	0	0	0	0	0	0	0
Toluene	43,527	230	0	0	2,264	1,500	0	0
Total GLPT Substances	12,447,158	462	255,340	3,139	14,170	2,144	10,815	0
Total TRI Substances	15,630,504	3,775	701,530	47,420	71,684	3,699	12,170	0

Appendix E: Great Lakes Persistent Toxic Substances Reported Released/Transferred (in Pounds) in 1997 by General Motors

	(per USEPA TRI Report)							
GENERAL MOTORS								
	OTHER				TOTAL			
	Release	Energy Rec.	Recycling	Treatment	Release	Energy Rec.	Recycling	Treatment
HEAVY METAL SUBSTANCES								
Antimony and Compounds	0	0	0	0	185	0	158,400	0
Arsenic and Compounds	0	0	0	0	0	0	0	0
Cadmium and Compounds	0	0	0	0	0	0	0	0
Chromium and Compounds	0	0	0	0	248,368	0	314,226	37,548
Copper and Compounds	0	0	0	0	385,747	0	13,890,495	77
Lead and Compounds	0	0	0	0	628,153	86	41,959,152	4,512
Nickel and Compounds	0	0	0	0	95,039	0	122,396	43
Silver and Compounds	0	0	0	0	0	0	0	0
Zinc and Compounds	360	0	670	0	11,985,062	1,024	176,041	4,000
HALOGENATED SUBSTANCES								
1,2-Dibromoethane	0	0	0	0	0	0	0	0
Dichloromethane	0	0	0	0	0	0	0	0
Tetrachloroethylene	0	0	0	0	32,000	6,000	25,000	0
Trichloroethylene	0	0	0	0	40,580	10,500	45,000	0
NON-HALOGENATED SUBSTANCES								
Benzene	0	0	0	0	171,478	1,460	3,820	55
Butyl benzyl phthalate	0	0	0	0	0	0	0	0
Di-(2-ethylhexyl) phthalate	0	0	0	0	914	1	0	0
Dibutylphthalate	0	0	0	0	0	0	0	0
Diethyl phthalate	0	0	0	0	0	0	0	0
Ethylbenzene	0	0	0	0	668,721	251,630	715,700	1,076
Naphthalene	0	0	0	0	83,145	0	114	401
Phenol	0	0	0	0	142,826	1,326	650	2,600
Polychlorinated biphenyls (PCBs)	0	0	0	0	0	0	0	0
Toluene	0	0	0	0	842,982	311,358	630,070	8,717
Total GLPT Substances	360	0	670		15,325,200	583,385	58,041,064	59,029
Total TRI Substances	46,370	3,200	670	8,800	35,108,027	2,963,387	66,910,107	582,305

Appendix F: Great Lakes Persistent Toxic Substances Released /Transferred (in Pounds) by AAMA Member Companies for 1995-1997 (per US EPA TRI Report)													
		1995 TOTAL				1996 TOTAL				1997 TOTAL			
CAS/Category #	METALS	Release	Energy Rec.	Recycling	Treatment	Release	Energy Rec.	Recycling	Treatment	Release	Energy Rec.	Recycling	Treatment
7440-36-0/N010	Antimony and Compounds	959	0	408,245	3	1,316	0	103,937	0	887	0	164,100	0
7440-38-2/N020	Arsenic and Compounds	0	0	0	0	0	0	0	0	0	0	0	0
7440-43-9/N078	Cadmium and Compounds	0	0	0	0	0	0	0	0	0	0	0	0
7440-47-3/N090	Chromium and Compounds	498,191	87	4,354,711	14,515	261,616	5	892,073	2,529	352,893	0	626,852	39,589
7440-50-8/N100	Copper and Compounds	597,320	1,089	45,270,036	10,040	313,580	1,555	39,607,365	110	574,547	0	16,660,286	5,839
7439-92-1/N420	Lead and Compounds	582,740	0	42,378,649	33,508	386,304	250	46,725,003	4,706	653,023	86	41,999,457	15,617
7440-20-0/N495	Nickel and Compounds	257,398	80,989	2,739,060	17,926	178,788	141	799,135	344	203,283	0	529,879	456
7440-22-4/N740	Silver and Compounds	0	0	0	0	215	0	2,381	0	38	0	3,800	0
7440-60-6/N982	Zinc and Compounds	16,405,237	2,009	109,1895	413,260	14,836,330	692	1,619,942	16,331	13,496,330	1,589	234,556	10,375
	HALOGENATED HYDROCARBONS												
0106-93-4	1,2-Dibromoethane	0	0	0	0	0	0	0	0	0	0	0	0
0075-09-2	Dichloromethane	304,059	117,000	581,200	22,079	86,847	13,000	180,000	15,982	41,660	0	90,000	200
0127-18-4	Tetrachloroethylene	144,211	17,000	1,600	0	141,235	3,300	643	0	32,000	6,000	25,000	0
0079-01-6	Trichloroethylene	923,570	0	347,000	38	585,900	136,000	21,000	55	518,580	99,500	45,000	140
	NON-HALOGENATED HYDROCARBONS												
0071-43-2	Benzene	186,686	4,102	349	1,750	249,937	4,582	366	1288	220,333	1,630	4,480	1,428
0085-68-7	Butyl benzyl phthalate	0	0	0	0	0	0	0	0	0	0	0	0
0117-81-7	Di-(2-ethylhexyl) phthalate	8,445	2	1,400	2,600	5,074	4	2	730	3,413	1	3	2,240
0084-74-2	Dibutylphthalate	0	0	0	0	0	0	0	0	0	0	0	0
0084-66-2	Diethyl phthalate	0	0	0	0	0	0	0	0	0	0	0	0
0100-41-4	Ethylbenzene	2,548,783	539,514	2,280,809	628,922	2,552,470	309,511	2,483,660	695,376	2,265,322	360,780	2,304,782	701,387
0091-20-3	Naphthalene	54,994	0	0	490	140,192	0	75	1,930	140,145	0	141	401
0108-95-2	Phenol	243,356	1,498	2,934	90,658	204,576	0	705	57,822	180,539	1,326	650	5,920
1336-36-3	Polychlorinated biphenyls (PCBs)	0	0	0	0	0	0	0	0	0	0	0	0
108-88-3	Toluene	1,465,977	174,642	889,799	181,994	1,412,187	181,769	619,236	128,734	1,276,392	358,803	1,002,557	145,025
	Total	24,221,926	1,522,432	193,785,102	1,971,211	21,356,567	650,809	93,055,523	925,937	19,959,385	829,715	63,691,543	928,617

Appendix F: GLPTs Reported Released/Transferred (in Pounds) in 1997 by AAMA Member Companies (per USEPA TRI Report)

AAMA MEMBER COMPANIES								
	ASSEMBLY				PARTS			
	Release	Energy Rec.	Recycling	Treatment	Release	Energy Rec.	Recycling	Treatment
HEAVY METAL SUBSTANCES								
Antimony and Compounds	609	0	0	0	278	0	164,100	0
Arsenic and Compounds	0	0	0	0	0	0	0	0
Cadmium and Compounds	0	0	0	0	0	0	0	0
Chromium and Compounds	9,758	0	0	0	135,840	0	291,074	39,550
Copper and Compounds	92,571	0	51,500	0	156,376	0	14,856,126	292
Lead and Compounds	60,609	0	1,412	3,257	106,417	86	41,992,775	12,360
Nickel and Compounds	79,479	0	4,953	0	40,923	0	120,218	90
Silver and Compounds	0	0	0	0	38	0	3,800	0
Zinc and Compounds	389,923	65	14,338	7,672	633,688	880	74,952	2,680
HALOGENATED SUBSTANCES								
1,2-Dibromoethane	0	0	0	0	0	0	0	0
Dichloromethane	12,600	0	0	0	29,060	0	90,000	200
Tetrachloroethylene	0	0	0	0	8,000	6,000	0	0
Trichloroethylene	0	0	0	0	518,580	99,500	45,000	140
NON-HALOGENATED SUBSTANCES								
Benzene	6,942	1,400	4,480	1,428	0	0	0	0
Butyl benzyl phthalate	0	0	0	0	0	0	0	0
Di-(2-ethylhexyl) phthalate	2,499	0	3	2,240	914	1	0	0
Dibutylphthalate	0	0	0	0	0	0	0	0
Diethyl phthalate	0	0	0	0	0	0	0	0
Ethylbenzene	2,176,952	358,488	2,277,882	655,599	88,085	2,290	26,900	45,788
Naphthalene	0	0	0	0	0	0	0	0
Phenol	0	0	0	0	33,020	1,326	0	0
Polychlorinated biphenyls (PCB's)	0	0	0	0	0	0	0	0
Toluene	1,036,341	349,747	969,427	92,772	156,776	7,320	33,130	52,253
Total GLPT Substances	3,868,283	709,700	3,323,995	762,968	1,907,995	117,403	57,698,075	153,353
Total TRI Substances	34,700,840	4,792,026	24,153,156	12,228,211	4,779,856	344,220	58,801,818	1,459,347

Appendix F: GLPTs Reported Released/Transferred (in Pounds) in 1997 by AAMA Member Companies (per USEPA TRI Report)

AAMA MEMBER COMPANIES								
	POWERTRAIN				STAMPING			
	Release	Energy Rec.	Recycling	Treatment	Release	Energy Rec.	Recycling	Treatment
HEAVY METAL SUBSTANCES								
Antimony and Compounds	0	0	0	0	0	0	0	0
Arsenic and Compounds	0	0	0	0	0	0	0	0
Cadmium and Compounds	0	0	0	0	0	0	0	0
Chromium and Compounds	202,761	0	276,111	18	2,483	0	5	0
Copper and Compounds	309,627	0	1,704,390	5,027	384	0	270	0
Lead and Compounds	485,887	0	5,270	0	110	0	0	0
Nickel and Compounds	67,594	0	288,125	353	2,129	0	4,241	0
Silver and Compounds	0	0	0	0	0	0	0	0
Zinc and Compounds	12,459,720	0	133,573	23	12,638	644	11,017	0
HALOGENATED SUBSTANCES								
1,2-Dibromoethane	0	0	0	0	0	0	0	0
Dichloromethane	0	0	0	0	0	0	0	0
Tetrachloroethylene	24,000	0	25,000	0	0	0	0	0
Trichloroethylene	0	0	0	0	0	0	0	0
NON-HALOGENATED SUBSTANCES								
Benzene	213,391	230	0	0	0	0	0	0
Butyl benzyl phthalate	0	0	0	0	0	0	0	0
Di-(2-ethylhexyl) phthalate	0	0	0	0	0	0	0	0
Dibutylphthalate	0	0	0	0	0	0	0	0
Diethyl phthalate	0	0	0	0	0	0	0	0
Ethylbenzene	252	2	0	0	33	0	0	0
Naphthalene	140,145	0	141	401	0	0	0	0
Phenol	147,519	0	650	5,920	0	0	0	0
Polychlorinated biphenyls (PCBs)	0	0	0	0	0	0	0	0
Toluene	80,871	236	0	0	2,402	1,500	0	0
Total GLPT Substances	14,131,767	468	2,433,260	11,742	20,179	2,144	15,533	0
	18,914,136	3,831	5,169,205	1,361,365	132,120	3,699	20,733	186,422

Appendix F: GLPTs Reported Released/Transferred (in Pounds) in 1997 by AAMA Member Companies (per USEPA TRI Report)

AAMA MEMBER COMPANIES								
	OTHER				TOTAL			
	Release	Energy Rec.	Recycling	Treatment	Release	Energy Rec.	Recycling	Treatment
HEAVY METAL SUBSTANCES								
Antimony and Compounds	0	0	0	0	887	0	164,100	0
Arsenic and Compounds	0	0	0	0	0	0	0	0
Cadmium and Compounds	0	0	0	0	0	0	0	0
Chromium and Compounds	2,051	0	59,662	21	352,893	0	626,852	39,589
Copper and Compounds	15,589	0	48,000	520	574,547	0	16,660,286	5,839
Lead and Compounds	0	0	0	0	653,023	86	41,999,457	15,617
Nickel and Compounds	13,158	0	112,342	13	203,283	0	529,879	456
Silver and Compounds	0	0	0	0	38	0	3,800	0
Zinc and Compounds	361	0	676	0	13,496,330	1,589	234,556	10,375
HALOGENATED SUBSTANCES								
1,2-Dibromoethane	0	0	0	0	0	0	0	0
Dichloromethane	0	0	0	0	41,660	0	90,000	200
Tetrachloroethylene	0	0	0	0	32,000	6,000	25,000	0
Trichloroethylene	0	0	0	0	518,580	99,500	45,000	140
NON-HALOGENATED SUBSTANCES								
Benzene	0	0	0	0	220,333	1,630	4,480	1,428
Butyl benzyl phthalate	0	0	0	0	0	0	0	0
Di-(2-ethylhexyl) phthalate	0	0	0	0	3,413	1	3	2,240
Dibutylphthalate	0	0	0	0	0	0	0	0
Diethyl phthalate	0	0	0	0	0	0	0	0
Ethylbenzene	0	0	0	0	2,265,322	360,780	2,304,782	701,387
Naphthalene	0	0	0	0	140,145	0	141	401
Phenol	0	0	0	0	180,539	1,326	650	5,920
Polychlorinated biphenyls (PCBs)	0	0	0	0	0	0	0	0
Toluene	2	0	0	0	1,276,392	358,803	1,002,557	145,025
Total GLPT Substances	31,161	0	220,680	554	19,959,385	829,715	63,691,543	928,617
	632,254	3,200	294,676	9,447	59,159,206	5,146,976	88,439,588	15,244,792

Appendix G: Table of US Auto Project Pollution Prevention Case Studies				
Code*	Pollution Prevention Project	Target Substance(s)	Project Description	Results
3	<u>Lead-Free Black Ceramic Paint</u> Chrysler McGraw Glass Plant	Lead in black ceramic glaze paint	Development, testing, and approval of a lead-free ceramic glaze paint.	<ul style="list-style-type: none"> • Source reduction of lead, eliminating 700 drums of hazardous waste annually.
3	<u>Recent Pollution Prevention Projects</u> Ford Michigan and Indiana Plants	Toluene and Trichloroethylene (TCE)	Paint "build-up" cleaning procedures changed. Two TCE degreasers replaced with water wash systems.	<ul style="list-style-type: none"> • Source reduction of 23,000 pounds of toluene annually. • Source reduction of 50,000 pounds of TCE annually.
2	<u>Reducing Freon Use</u> General Motors Lansing Automotive Division	Chlorofluorocarbons (CFCs)	Replacement of CFC-containing materials with acceptable and cost-effective alternatives.	<ul style="list-style-type: none"> • Source reduction of CFCs used in degreasing operations by substitution with HCHC-141B. • 40% reduction in the use of aerosol cans of degreaser.
1	<u>Non-Production Material Screening</u> Chrysler - Corporate Wide	All regulated substances; e.g., butyl benzyl phthalate (BBP)	Focus on pollution prevention practices that eliminate, substitute or reduce regulated substances from products supplied to Chrysler.	<ul style="list-style-type: none"> • Elimination, substitution and/or reduction of regulated substances; e.g., the elimination of BBP in transmission fluid.
1	<u>Handling of Spent Lead-Acid Batteries</u> Ford - Corporate Wide	Lead-acid in automotive and industrial batteries.	Guidelines established for the handling of spent lead-acid batteries, including reclamation, storage, and labeling provisions.	<ul style="list-style-type: none"> • Off-site reclamation of industrial lead-acid batteries. • Off-site recycling of automotive batteries.
4	<u>Substitution with a Solvent-Free Adhesive</u> General Motors Lansing Fabrication Plant	Toluene	Substitution to a solvent-free adhesives.	<ul style="list-style-type: none"> • Elimination of 300 tons of toluene releases annually. • Related hazardous waste reduced from 3000 to 400 gallons annually.
1	<u>Mercury Reduction Program</u> Chrysler - Corporate Wide	Mercury	Modification of specifications to eliminate mercury. Decommissioning of mercury containing equipment. Evaluation of alternatives for blood pressure measurement equipment.	<ul style="list-style-type: none"> • Mercury removed from twenty engineering equipment specs. • 1000 pounds of decommissioned mercury collected in the first year. • Mercury-free alternatives to sphygmomanometer s identified.

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Appendix G: Table of US Auto Project Pollution Prevention Case Studies

Code*	Pollution Prevention Project	Target Substance(s)	Project Description	Results
3	<u>Process Change to Eliminate the Use of Trichloroethylene</u> Ford Climate Control Division (CCD)	TCE	Replacement of a TCE degreaser with a detergent water wash.	<ul style="list-style-type: none"> Pilot project led to a Ford CCD recommendation that the aqueous process replace all existing TCE degreasers world-wide on a normal business cycle basis.
3	<u>Reformulation of PVC Insulation</u> General Motors Packard Electronic Division	Lead	Supplier partnership with Packard Electric to reformulate the stabilizer system to eliminate heavy metals.	<ul style="list-style-type: none"> Lead-free PVC insulation reduced hazardous waste and disposal costs. Increased feasibility of automobile recycling.
1	<u>PCB Elimination Program</u> Chrysler - Corporate Wide	Polychlorinated biphenyls (PCBs)	Company-wide program to eliminate PCB-containing equipment.	<ul style="list-style-type: none"> Elimination of PCB prioritized by equipment condition.
3	<u>Recovering Lead From Wastewater</u> General Motors Deco Remy (Anderson, Indiana)	Lead from battery-making operations	Installation of wastewater treatment facility that recovers lead from process water in a manner that makes it suitable for recycling.	<ul style="list-style-type: none"> Annual recycling of 125,000 pounds of lead.
1	<u>Surface Coating Toxics Reduction Program</u> Chrysler - Corporate Wide	Volatile Organic Compounds (VOCs), Lead, and hexavalent Chromium	Source reduction of VOCs, lead, and hexavalent chromium in coating processes.	<ul style="list-style-type: none"> Introduction of low- or no-VOC/toxic surface coatings. Elimination of lead from all color basecoats. Elimination of hexavalent and trivalent chromium in phosphate pretreatment.
3	<u>Solvent-Free Spray Adhesives for Interior Trim</u> General Motors, Inland Fisher Guide (Livonia, Michigan)	VOCs: methylene chloride, methyl ethyl ketone, hexane, and toluene	Substitution with a solvent-free adhesive for interior trim.	<ul style="list-style-type: none"> Substituted water-based adhesive eliminating twenty tons of VOC emissions. Conversion of solid waste stream from hazardous to non-hazardous. Estimated disposal savings of \$500 per week.

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Appendix G: Table of US Auto Project Pollution Prevention Case Studies

Code*	Pollution Prevention Project	Target Substance(s)	Project Description	Results
3	<u>Elimination of Chromium from Radiator Paint</u> Chrysler Dayton Thermal Products Facility	Chromium and hazardous waste sludge	Reformulation of radiator paint to be chromium-free.	<ul style="list-style-type: none"> • Source reduction of chromium through development of water-based substitute. • Elimination of approximately 18,000 gallons (90 cubic yards) of hazardous paint waste annually.
2	<u>Rescheduling Paint Booth Cleaning Reduces Solvent Use & VOC Emissions</u> General Motors Fairfax Assembly Plant	VOCs	Modification of paint spray booth cleaning schedule, reducing the cleaning of certain automated sections from every other day to weekly.	<ul style="list-style-type: none"> • Reduced annual VOC emissions from purge solvent by 369 tons.
2	<u>Post-Consumer Anti-Freeze Remanufacturing</u> Chrysler	Ethylene glycol anti-freeze and heavy metals (lead, copper, & zinc)	Partnership with Dow Chemical, BASF, and INTAC to develop an infrastructure for the collection of used anti-freeze for remanufacturing and reuse.	<ul style="list-style-type: none"> • Recycling of anti-freeze discourages improper disposal, thereby reducing discharges of ethylene glycol and heavy metals to the environment.
3	<u>Toluene Emissions Minimized</u> Ford Utica Plant	Toluene	Reduction in the use of toluene-based adhesives, through substitution with water-based and hot-melt adhesives and through implementation of vibrating welding.	<ul style="list-style-type: none"> • Source reduction of toluene. • Reduction of 60% (over 200,000 pounds) of annual toluene emissions.
3	<u>Copper and Nickel Reclamation from Plating Waste</u> General Motors Inland Fisher Guide Plant (Anderson, Indiana)	Copper and nickel	Off-site reclamation of nickel and copper from nitric acid, made possible by a small tanker (built on a pickup truck chassis) used to ferry the acid from an otherwise inaccessible storage tank to the reclamation facility's large tanker truck.	<ul style="list-style-type: none"> • Annual reclamation of 68 tons of copper and 40 tons of nickel, which would have been disposed of as hazardous waste sludge. • Savings of \$23,000 in annual wastewater treatment costs.
2	<u>Adjusting Paint Equipment Reduces Emissions and Solid Waste, and Saves Money</u> General Motors Hamtramck Assembly	VOCs and paint sludge (toluene, xylene methanol, & butyl cellosolve acetate)	Paint spray equipment timing was fine-tuned, so that excess paint is no longer sprayed after the target body moves out of range.	<ul style="list-style-type: none"> • Source reduction of 5.5 tons of VOCs. • Reduction of 4 tons of paint sludge from paint overspray. • \$85,000 in annual savings.

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Appendix G: Table of US Auto Project Pollution Prevention Case Studies

Code*	Pollution Prevention Project	Target Substance(s)	Project Description	Results
4	<u>Stamping Plant Toxic Reductions</u> Chrysler Warren Stamping Plant	VOCs, Hazardous Air Pollutants (HAPs), including toluene & zinc	Implementation of the pollution prevention hierarchy to target reportable releases under SARA 313.	<ul style="list-style-type: none"> • Reduction of 215 tons of VOC/HAP emissions from 1988 to 1994. • Reduction of 52,000 lb. of toluene releases. • Elimination of 7000 pounds of zinc through reformulation of press oil.
3	<u>Reducing the Release of Trichloroethylene and Methylene Chloride</u> Ford Ypsilanti Plant	TCE and methylene chloride	Production change to replace field-wound starters with permanent magnet starters, which reduced the use of chlorinated solvents.	<ul style="list-style-type: none"> • Elimination of TCE and methylene chloride from drawing and cleaning compounds. • Reduction in annual TCE releases by 30,000 pounds.
2	<u>Pollution Prevention Projects with the Neon</u> Chrysler Belvidere, Illinois Assembly Plant	VOCs, HAPs, and hazardous wastes in sealers (solvents, asbestos, and benzyl butyl phthalate)	Introduced waterborne topcoats and instituted block painting. Introduced use of waterborne underbody sound deadener. Installed sludge drying and handling system to produce dry powder acceptable for recycling. Adopted lower VOC blank washing. Reformulated sealer to remove asbestos and benzyl butyl phthalate.	<ul style="list-style-type: none"> • Reduction in average VOC emissions from 4 to 1.5 pounds per vehicle produced. • Sound deadener emits less than .01 pounds of VOC per car produced. • Paint recycling has avoided landfilling 1300 cubic yards of waste per year. • Lower VOC blank washing compound reduced 85 tons of VOCs per year. • Asbestos removed from sealer; solvent content reduced to less than .1 pounds per gallon; phthalate content reduced over 98%.
1	<u>Environmental Excellence Recognition (CHEER) Program</u> Chrysler Corporate and Facility	All waste generation	CHEER Awards Program implemented to encourage and reward pollution prevention initiatives corporate-wide.	<ul style="list-style-type: none"> • Over 70 nominations received. • Award-winners include replacing conventional car body solvent wipes with disposable "wet task pop-ups" and achieving a high gloss black finish on exterior parts using an uncoated ASA plastic resin instead of paint.

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Appendix G: Table of US Auto Project Pollution Prevention Case Studies

Code*	Pollution Prevention Project	Target Substance(s)	Project Description	Results
3	<u>Plant Eliminates Methylene Chloride</u> General Motors Columbus, Ohio Inland Fisher Guide	Methylene chloride	Methylene chloride replaced with high pressure water to strip paint masks.	<ul style="list-style-type: none"> • Elimination of methylene chloride from plant (207,000 pounds per year). • Reduction of SARA 313 releases by 166,091 pounds per year, a 67% decrease.
2/3	<u>Reducing Chrome, VOC at the Source</u> General Motors Moraine and Dayton, Ohio Plants	1,1,1-Trichloroethane and chrome	Solvent-based paints replaced with waterborne paints. Solvent degreasers replaced with water wash. Air-assisted spray implemented. Compressor paint operation eliminated.	<ul style="list-style-type: none"> • Source reduction of 219,000 pounds of SARA 313 chemicals including 203 tons of 1,1,1-trichloroethane. • 65% decrease in VOC emissions. • 40% reduction in paint sludge. • 95% source reduction of chromium.
3	<u>Tetrachloroethylene</u> Ford Rawsonville Plant	Tetrachloroethylene (perchloroethylene)	Solvent degreasing systems replaced with water wash or water wash and detergent systems.	<ul style="list-style-type: none"> • Tetrachloroethylene use eliminated.
5	<u>Elimination of Trichloroethane Vapor Degreasers</u> Chrysler Toledo Machining Plant	Trichloroethane (TCA)	TCA vapor degreasing system replaced with alkaline soap and water wash.	<ul style="list-style-type: none"> • Elimination of TCA from plant, eliminating 14,700 pounds of TCA release. • Oily water byproduct is classified as non-hazardous and is treated on-site.
5	<u>Solvent Use Reduction at Engine Plant</u> Ford Romeo Engine Plant	Cleaning solvents	Elimination of listed substances through replacement of solvents with petroleum naphtha, coupled with a self-filtering and cleaning station.	<ul style="list-style-type: none"> • 57% cost savings. • 47% reduction by volume of waste solvent. • Elimination of listed substances. • Elimination of 4 of 22 cleaning stations.

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Appendix G: Table of US Auto Project Pollution Prevention Case Studies

Code*	Pollution Prevention Project	Target Substance(s)	Project Description	Results
3	<u>Recycling Chrome from Rinsewater</u> General Motors Delphi Energy and Engine Management Systems (Grand Rapids, Michigan)	Chrome	Redesign of rinse overflow tanks in chrome plating process to allow chrome to be recycled.	<ul style="list-style-type: none"> • Elimination of 3200 pounds of chrome. • Cost savings of \$30,000 thus far. • 750% reduction in wastewater to be treated. • Reduction of water usage by 8750 tons per year. • Reduction of 60 tons of sludge per year.
5	<u>Mineral Spirits Elimination in Machining Plants</u> Chrysler Kenosha Engine and Toledo Machining Plants	Hazardous waste mineral spirits	Mineral spirits replaced with water-based cleaner which is non-hazardous, non-toxic, and biodegradable.	<ul style="list-style-type: none"> • Elimination of 114,000 pounds of hazardous waste mineral spirits per year.
1	<u>Waste Prevention Strategy Implementation</u> Ford Worldwide Operations	Reportable substances, non-hazardous industrial waste (oils, fluids, plastics, packaging)	Implementation of environmental strategy to align complex environmental initiatives with business planning processes.	<ul style="list-style-type: none"> • Projects in progress include solvent absorption media research, waste minimization/prevention assessments, training, energy reduction evaluations, and alternative coating systems.
3	<u>Removing Lead and Solvent from Automotive Electronics Operations</u> General Motors Hughes Electronics' Delco Electronics (Oak Creek, Wisc.)	Lead, CFCs, and VOCs	Switch to a non-corrosive, "no clean" soldering flux, which eliminated the need for CFC cleaning of circuit boards. Reformulation of circuit board protective coating to reduce its solvent content.	<ul style="list-style-type: none"> • Elimination of 8000 pounds of lead-bearing dross. • Elimination of 37 tons of VOCs and 5 tons of VOC hazardous waste annually. • Reduction of 24 tons of CFC waste.
1	<u>Ford Pollution Prevention Strategy</u> Ford - Corporate Wide	All manufacturing wastes	Integration of pollution prevention practices into business decision-making processes, and encouragement of suppliers to do the same.	<ul style="list-style-type: none"> • Establishment of supplier guidelines focusing on materials, processes and facilities.

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Appendix G: Table of US Auto Project Pollution Prevention Case Studies

Code*	Pollution Prevention Project	Target Substance(s)	Project Description	Results
2	<u>Glycol Ether Reduction in Surface Preparation Materials</u> Chrysler Newark Assembly Plant	Glycol ethers	Reformulation of a surfactant to remove glycol ether content.	<ul style="list-style-type: none"> • 91% source reduction of 158,415 pounds of glycol ether. • Material cost savings of \$500,000. • Reduced employee exposure.
3	<u>Plant Sets 95% Goal to Reduce TRI Releases</u> Chrysler Dayton Thermal Products Plant	Eight TRI-reportable chemicals, including Freon, dichloromethane, methyl chloroform, and chromium	<p>Freon degreasing operation replaced with a vacuum deoiling system; methyl chloroform degreaser replaced with an aqueous wash.</p> <p>Production paint reformulated to remove chromium and glycol ether; maintenance paint replaced with a water-based alternative.</p> <p>Dichloromethane replaced with a water-based release agent in plastic injection moldings.</p> <p>Freon replaced with helium as a leak detection agent for air conditioning components.</p>	<ul style="list-style-type: none"> • Elimination of 137,000 lb. of Freon 113. • Elimination of 400,000 lb. of methyl chloroform. • 74% reduction in glycol ether releases. • Elimination of 66,000 pounds of lead dross hazardous waste. • 74% reduction (89,000 pounds) of zinc compound releases. • Elimination of 6200 pounds of dichloromethane, saving \$5600 per year.
1	<u>Implementing a Supplier Solvent Management Program Reduces Solvent and Cleaner Use and VOC Emissions</u> Chrysler - Corporate Wide	VOCs from solvents and related cleaners from assembly plant paintshops	<p>Solvent Management Program</p> <ul style="list-style-type: none"> • transferred the technology of pre-moistened solvent wipes to all assembly plants. • implemented waterborne basecoat paints with new vehicle model launch, and reformulated purge solvents to be HAPs/SARA-free. • implemented zero-VOC tacky booth coating to allow easier clean-up of overspray, and low-VOC grate coatings to allow water-blasting of floor overspray build-up while grates are in place. 	<ul style="list-style-type: none"> • Solvent emissions reduced by 48%. • Reduction in basecoat VOC content. • Reduction of 51 tons of HAPs/SARA releases. • 1/3 reduction in plant emissions of xylene, ethyl benzene, and methyl isobutyl ketone. • 1995 VOC levels (6.59 pounds per unit) were just 52% of 1993 levels; other plants achieving similar reductions.

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Appendix G: Table of US Auto Project Pollution Prevention Case Studies				
Code*	Pollution Prevention Project	Target Substance(s)	Project Description	Results
3	<u>Molded Fiberglass Headliner Offal Reduction Project</u> Ford Utica Plant	Chalet cloth offal	Changed the specs for chalet cloth, fiberglass matte, and foam/glue composite used to manufacture headliners from 59" X 71" to 55" X 68" so as to produce less offal.	<ul style="list-style-type: none"> • 15% (45-ton) reduction of offal generated per year. • Annual savings of \$430,000.
2	<u>Basecoat and Solvent Reduction Project</u> Ford assembly plant	Paint and solvent	Fine-tuned the timing of a paint spray nozzle to improve its transfer efficiency.	<ul style="list-style-type: none"> • Reduction of 28,330 pounds of paint and solvent use per year. • Annual savings of \$63,224. • Reduction in usage of paint sludge treatment chemical.
1	<u>PCB Transformer Phase-out Plan</u> Ford - Corporate Wide	Polychlorinated biphenyl	PCB transformers targeted for complete phase-out, especially those near cafeterias, areas of potential production interferences, floor drains, or areas of high personnel traffic.	<ul style="list-style-type: none"> • Removal of 26% of all PCB transformers to date (37 in 1995, 230 in 1996).
5	<u>Reducing Air Emissions by Conserving Compressed Air</u> General Motors Saginaw Metal Casting Operations	Air emissions associated with compressed air generation.	<p>Compressor system upgraded by:</p> <ul style="list-style-type: none"> • replacing controls to maintain pressure within +/- 1 psi (not 10 psi), allowing system to operate at 100 psi (not 110 psi). • modifying the air piping system, and updating the schematic drawings • identifying and repairing leaks; adding process-controlled shut-off valves. • refurbishing nine large air dryers so that they are regenerated only when the drying agent becomes saturated with moisture. 	<ul style="list-style-type: none"> • Air-flow rate through any leaks in system reduced • surge capacity improved • leaks repaired; segments of system can be shut off during non-production periods • reduction in air required for dryer regeneration

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Appendix G: Table of US Auto Project Pollution Prevention Case Studies

Code*	Pollution Prevention Project	Target Substance(s)	Project Description	Results
2	<u>Reducing VOC Emissions from Purge Solvent</u> General Motors Oklahoma City Assembly Plant	VOC emissions from purge solvent	Solvent VOC content reduced. Painting equipment adjusted to minimize required purge solvent. Maintenance procedures changed to include more hand-wiping and brushing of booth surfaces and less spraying of solvent. Booth surfaces covered with removable thin plastic masking.	<ul style="list-style-type: none"> • pounds of VOC emissions avoided by switching to lower-VOC solvent • paint solvent use reduced by 52,000 gallons • corresponding VOC emissions reduced by 362,440 pounds
2	<u>Reducing Air Emissions and Solid Waste from Vehicle Painting Operations</u> General Motors Detroit-Hamtramck Assembly Plant	Waste paint	Methodology developed to shut off paint flow to paint-applying equipment while paint is still being applied, to reduce the amount of waste paint purged from the lines prior to color changes.	<ul style="list-style-type: none"> • paint waste reduced by 15,000 gallons per year
4	<u>Adhesive Waste Reduction</u> Chrysler Warren Stamping Plant	Waste Adhesives	Inefficiencies in the adhesive pumping process resulted in the disposal of usable adhesive material. Increasing costs led to the identification and reduction of these inefficiencies.	<ul style="list-style-type: none"> • elimination of 13,200 gallons of waste adhesive per year • cost savings of approximately \$500,000 per year • improved quality
2	<u>Paint Shop VOC Reduction Program</u> Ford Norfolk Assembly Plant	VOC Emissions from paint solvents	Paint area management asked suppliers to review and improve, where possible, the current method of solvent usage and to also review the spray booth cleaning procedure.	<ul style="list-style-type: none"> • VOC solvent reduction of approximately 1,000 gallons per week • Annual cost savings of \$95,355 per year • VOC reduction of 342,713 lb./year
3	<u>Recycling Aluminum for Auto Components Saves Energy</u> General Motors Bedford Powertrain	Virgin aluminum, electrical energy and associated air emissions	Metallurgists at Bedford developed the necessary techniques to increase post-consumer scrap usage.	<ul style="list-style-type: none"> • savings of 56 billion BTUs per day
2	<u>Plant Reduces Toxicity of Waste Oil</u> Chrysler Belvidere Assembly Plant	Waste Oil	Reclassification of waste oil waste stream that was previously classified as hazardous.	<ul style="list-style-type: none"> • Elimination of D001, D008, and F001 hazardous classifications

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Appendix G: Table of US Auto Project Pollution Prevention Case Studies

Code*	Pollution Prevention Project	Target Substance(s)	Project Description	Results
2	<u>Paint Shop Maintenance VOC Reduction Program</u> Ford Ohio Assembly Plant	VOC Emissions from solvents	Replacement of solvent - based cleaners with water soluble cleaners.	<ul style="list-style-type: none"> VOC emissions from paint booth maintenance reduced from 8.6 to 1.1 tons per month, i.e., 90 ton reduction per year annual savings = \$34,000
2	<u>Computer Chips Greatly Reduce Electrical Consumption in HVAC</u> General Motors Fairfax Assembly	Electrical energy and associated air emissions	Installation of computer chips to control the energy usage of the electric motors that power the HVAC fans.	<ul style="list-style-type: none"> savings of 4.3 million kilowatt - hours of energy per year
2	<u>Windshield Insertion Solvent Wipe Reduction</u> Chrysler Belvidere Assembly Plant	Waste solvent wipe rags	Installation of a robot to automatically apply solvent to windshields and to wipedown windshields.	<ul style="list-style-type: none"> reduced waste wipe rags by 56 55-gallon drums per year reduction of Naphtha and MEK emissions cost reduction of \$12,000 per year improved process quality
2	<u>Optimization of Paint Usage</u> Ford Wayne Assembly Plant	Paint Usage	Development of optimal paint booth settings.	<ul style="list-style-type: none"> reduction of 79,158 lb./year of paint projected reduction of 159,500 lb./year
2	<u>Improving Electrical Quality Reduces Electrical Consumption</u> General Motors Fairfax Assembly	Electrical energy and associated air emissions	Testing and recalibration of energy system filters.	<ul style="list-style-type: none"> energy savings of more than 3.8 million kilowatt - hours per year
3	<u>Kokomo Transmission Plant Reuses Plastic</u> Chrysler Kokomo Transmission Plant	Colored plastic protective caps and plugs	Initiation of a system to reuse plastic caps and plugs.	<ul style="list-style-type: none"> reduction of landfilled waste by 1.25 million lb. annually annual savings from reuse of 50,000 lb. of plastic caps and plugs
6	<u>Chlorine Use Reduction at Michigan Proving Grounds</u> Ford Michigan Proving Ground	Chlorine and Activated Carbon	Project focused on eliminating chlorine use and thus the potential for chlorine residual in the final effluent while meeting other discharge permit requirements.	<ul style="list-style-type: none"> annual reduction of 600 gal. of chlorine annual reduction of 2,500 lb. of activated carbon estimated

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Appendix G: Table of US Auto Project Pollution Prevention Case Studies

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2	<u>Elimination of Mercury Switches in Underhood and Trunk Lamps</u> 1998 Cadillac and Buick Models	Mercury	Use of ball-type switches in place of mercury switches in underhood and trunk lamps in 1998 Cadillac and Buick models.	<ul style="list-style-type: none"> • elimination of mercury from underhood and trunk lamps • annual reduction of 1,500 lb. of mercury from underhood switches alone
1	<u>Chrome-Free Phosphate Post Treatment</u> Chrysler Corporate Wide	Chromium and chromium compounds	A study to consider reduction of highly regulated substances from Chrysler products and processes for lower costs and preservation of manufacturing and design flexibility.	<ul style="list-style-type: none"> • potential cost savings and minor reduction in weight savings with equal performance to current chrome containing process • potential annual reduction of \$45,000 lb. of chrome
2	<u>Wastewater Treatment Sludge Reduction</u> Atlanta Assembly Plant	Hazardous Sludge and Wastewater Treatment Chemicals	This project represents the improved treatment and disposal level of environmental hierarchy by improving treatment efficiency and reducing treatment chemical use and waste disposal volume.	<ul style="list-style-type: none"> • annual savings in hazardous sludge transportation/disposal costs • annual savings in wastewater treatment chemical costs
2,3	<u>Reusing/Recycling of Steel Anti-Rotation Pins</u> GM Delphi/Saginaw Steering Systems	Steel	Recovery and reuse of steel pins.	<ul style="list-style-type: none"> • annual savings of over \$700,000 • reduction of over 24 tons of landfilled solid waste
1	<u>Lead-Free Electrocoat</u> Chrysler Corporate Wide	Lead and lead compounds	A study to consider the life cycle costs of lead-free electrocoat versus the current lead containing material.	<ul style="list-style-type: none"> • potential significant cost savings • reduction in hazardous disposal costs • improved quality
2,4	<u>Wastewater Treatment Improvement</u> Wayne Assembly and Wayne Integral Stamping Plant	Wastewater and wastewater treatment chemicals	Costs associated with effective treatment of wastewater were benchmarked and a plan was initiated to conduct a series of cost analyses prior to treatment to ascertain the most economical procedures and treatments.	<ul style="list-style-type: none"> • realized savings of \$125,000 • additional projected savings of \$76,000 due to coagulant minimization

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Appendix G: Table of US Auto Project Pollution Prevention Case Studies				
Code*	Pollution Prevention Project	Target Substance(s)	Project Description	Results
2	<u>Recycled Plastic in Hush Panels</u> Orion and Buick City Assembly Plants	Plastic used in vehicle parts	Use of recycled scrap plastic to produce vehicle instrument panel insulators.	<ul style="list-style-type: none"> • conserves over 200,000 lb. of virgin plastic material per year • annual savings
2	<u>Electrocoat Skid Washer Anolyte Conversion</u> Chrysler Sterling Heights Assembly	Waste anolyte and VOC Emissions	A study to examine alternative cleaning methods for the J Hook and Body Skid conveyers	<ul style="list-style-type: none"> • elimination of 22,000 gal. of hazardous material for treatment and disposal • VOC reduction of 7.3 tons/yr.
1	<u>Ford Chromium Free in Pre-Paint Coating</u> Ford Corporate Wide	Chromium	Eliminating the use of Chromium in the pre-paint coating process	<ul style="list-style-type: none"> • reduction of Chromium in coating process • annual savings of \$20,000 per plant
3	<u>Reuse of Specialized Test Fuels</u> GM - Delphi Energy and Engine Management Systems' Engineering Center	Benzene, toluene, ethylbenzene, xylene, and lead	Initiation of a system to reuse testing fuel for fleet vehicles	<ul style="list-style-type: none"> • annual savings of \$6,000
1	<u>Chrysler Corporation Underhood Mercury Switch Life Cycle Management</u> Chrysler Corporate Wide	Mercury	Evaluation of hidden costs associated with the continued use of the Mercury switches compared to other available lighting alternatives	<ul style="list-style-type: none"> • annual savings of \$18,000 through the use of a rolling ball switch
3	<u>Recycling of Reaction Injection Molded Material at the Visteon Utica Plant</u> Ford Visteon Utica Plant	Polyurethane waste material	Creation of a rigid polyurethane recycling facility to convert polyurethane scrap into polyol	<ul style="list-style-type: none"> • elimination of 300,000 lb./yr. of polyurethane wastes • annual savings of \$9,600
3	<u>New Auto Parts Made from Recycled Post Industrial Plastic Scrap</u> Spring Hill Saturn Plant	Post industrial plastic scrap	Use of post industrial scrap plastic to manufacture new parts	<ul style="list-style-type: none"> • recycling and reprocessing of 1,085 tons/yr. of polymer scrap • reduction in costs of Saturn products

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Appendix G: Table of US Auto Project Pollution Prevention Case Studies

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1	<u>Chrysler Corporation Evaluation of a Take Apart Spin on Cartridge Oil Filter System</u> Chrysler Corporate Wide	Spent engine oil and expendable filter housings	Evaluation of hidden costs associated with continued use of the disposable steel filter systems compared to a TASO cartridge system	<ul style="list-style-type: none"> • greater environmental advantage with the TASO switch with a minimal cost difference of \$0.23
1	<u>Ford Design for Environment Training Update</u> Ford Corporate Wide	All environmental wastes	Ford has initiated DFE training that provides product and manufacturing engineers a process to systematically consider environmental improvement opportunities in each new program or project.	<ul style="list-style-type: none"> • reduction of potentially long-term environmental burdens
2	<u>Turning off the Water Saves Millions of Gallons</u> GM Fairfax Assembly Plant	Wastewater	Installation of a photoelectric cell connected to a timer to control the flow of rinse water	<ul style="list-style-type: none"> • annual reduction of 6.5 million gal. of water • annual savings of \$33,000
1	<u>Life Cycle Management of Automotive Cowlings</u> Chrysler Corporate Wide	ASA plastic	An LCM comparison of an existing ASA cowl versus an alternative thermoplastic olefin (TPO) cowl	<ul style="list-style-type: none"> • annual cost savings of \$176,000 with the use of TPO • TPO is 100% recyclable
2,5	<u>Prevention First Initiative at Ohio Assembly</u> Ford Ohio Assembly Plant	Source reduction and recycling	A waste minimization/pollution prevention team identified opportunities to meet and exceed the Ohio Prevention First pledge to reduce waste generated	<ul style="list-style-type: none"> • waste per vehicle produced has been reduced from 142 lb./vehicle in 1993 to 84 lb./vehicle in 1997 • annual savings of \$600,000
2	<u>Mold-in-Color Process Replaces Painting of Steering Column Shrouds</u> GM - Delphi Saginaw Steering Systems	Diethylene glycol monobutyl ether, isopropyl alcohol, 2-butoxyethanol, and petroleum distillates	The elimination of painted shrouds with mold-in-color process to reduce emissions and costs	<ul style="list-style-type: none"> • elimination of paint emissions by approx. 7 tons/yr. • annual savings of \$700,000
1	<u>Life Cycle Management of Protective Seat Covers</u> Chrysler Corporate Wide	LPDE/HPDE plastic	A slip cover system was implemented to replace a monolayer elastic bag protective seat cover due to lower LCM costs.	<ul style="list-style-type: none"> • diverted 90,000 lb.. of plastic from landfill annually • annual savings of \$136,200

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Appendix G: Table of US Auto Project Pollution Prevention Case Studies

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2	<u>Solvent VOC Reduction Program</u> Ford Wayne Stamping and Assembly Plant	VOC solvents and emissions from assembly plant paintshops	Four areas were identified for needing improvements <ul style="list-style-type: none"> • spray booth floor cleaning procedures • reprogramming of clearcoat purge cycles • handsprayers' cleaning methodologies • automation cleaning methodologies 	<ul style="list-style-type: none"> • VOC solvent usage was reduced by 230,000 gal. annually • annual savings of \$460,000
3	<u>Elimination of Solvent Cleaning for Paint Spray Gun Caps</u> GM Moraine Assembly Plant	Actone, methyl alcohol, isopropyl alcohol, methyl-isobutyl-ketone	Replaced VOC solvent from the gun-cleaning process for basecoat painting with warm water	<ul style="list-style-type: none"> • Eliminated 280 tons/yr. of VOC emissions
1	<u>Chrysler Corporation PCB Elimination Program</u> Chrysler Corporate Wide	Polychlorinated biphenyls (PCBs)	Elimination of PCBs in all facilities	<ul style="list-style-type: none"> • PCB transformers and 10,000 PCB capacitors eliminated • negates the potential of plant shutdowns and the astronomical costs associated from it
3	<u>Assessment of Magnesium vs. Aluminum for use as a Lightweight Transmission Case</u> 1995 Ford Contour Models	Magnesium	Project focused on looking at the advantages of using magnesium instead of aluminum in terms of light weighting the transmission case	<ul style="list-style-type: none"> • a 30% weight reduction is achieved when magnesium is used • better fuel economy due to light weighting of car
2	<u>Reducing the Volume and Cost of Plating Waste</u> GM Technical Center	Nickel, copper, cyanide, and zinc	Treated rinsewater from the plating operations was reduced due to extending the retention time in the settling tank which improved the separation of water from heavy metal sludge	<ul style="list-style-type: none"> • reduction of wastewater pump-out by 62.4 tons during the first year of implementation • annual savings of \$8,282

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